DIESEL PROGRESS

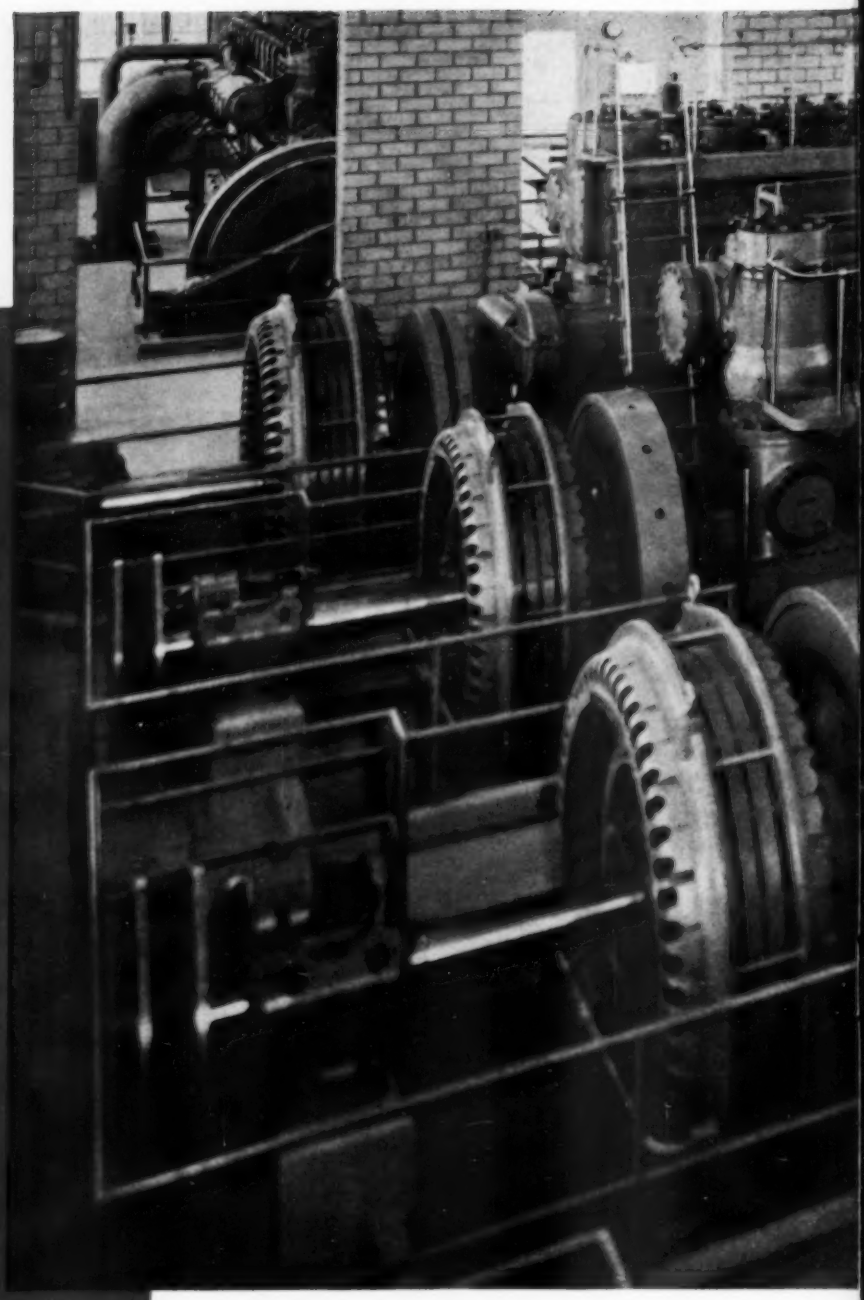
IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

FIVE DOLLARS PER YEAR

OCTOBER, 1953

FIFTY CENTS PER COPY

2 COSTS THAT CAN BE CUT...

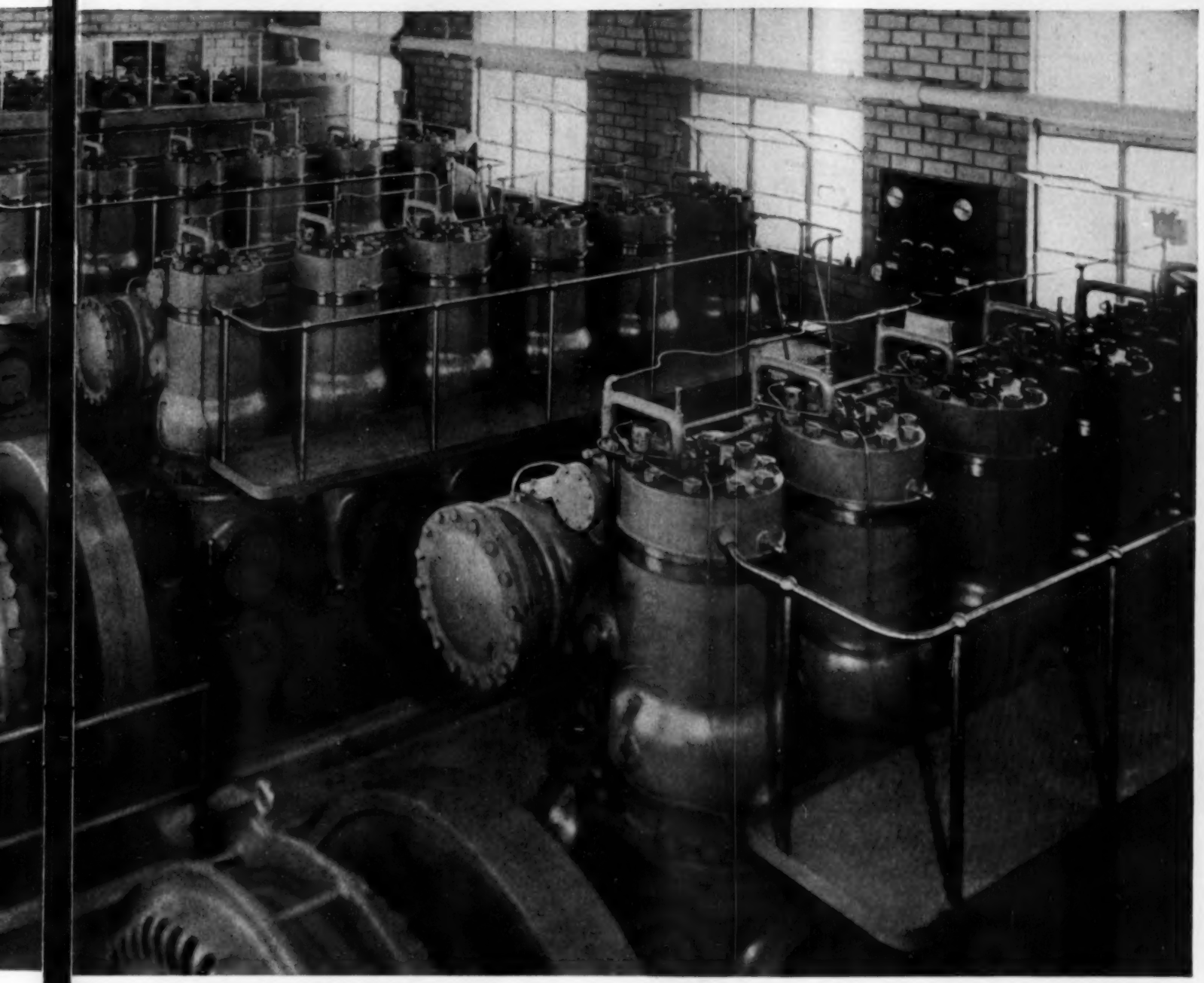


BY USING the lubricating oil that's *exactly right* for your particular Diesels and operating conditions, you can save on 1) the amount of fuel used, and 2) your maintenance costs.

Texaco makes *a complete line* of lubricating oils for Diesel, gas and dual-fuel engines—the *Texaco Ursa Oil* series—especially designed to resist oxidation and assure clean operation. *Texaco Ursa Oils*

TEXACO

TEXACO



keep engines free from carbon and sludge . . . keep rings free for proper compression and combustion . . . assure longer life for bearings and other moving parts.

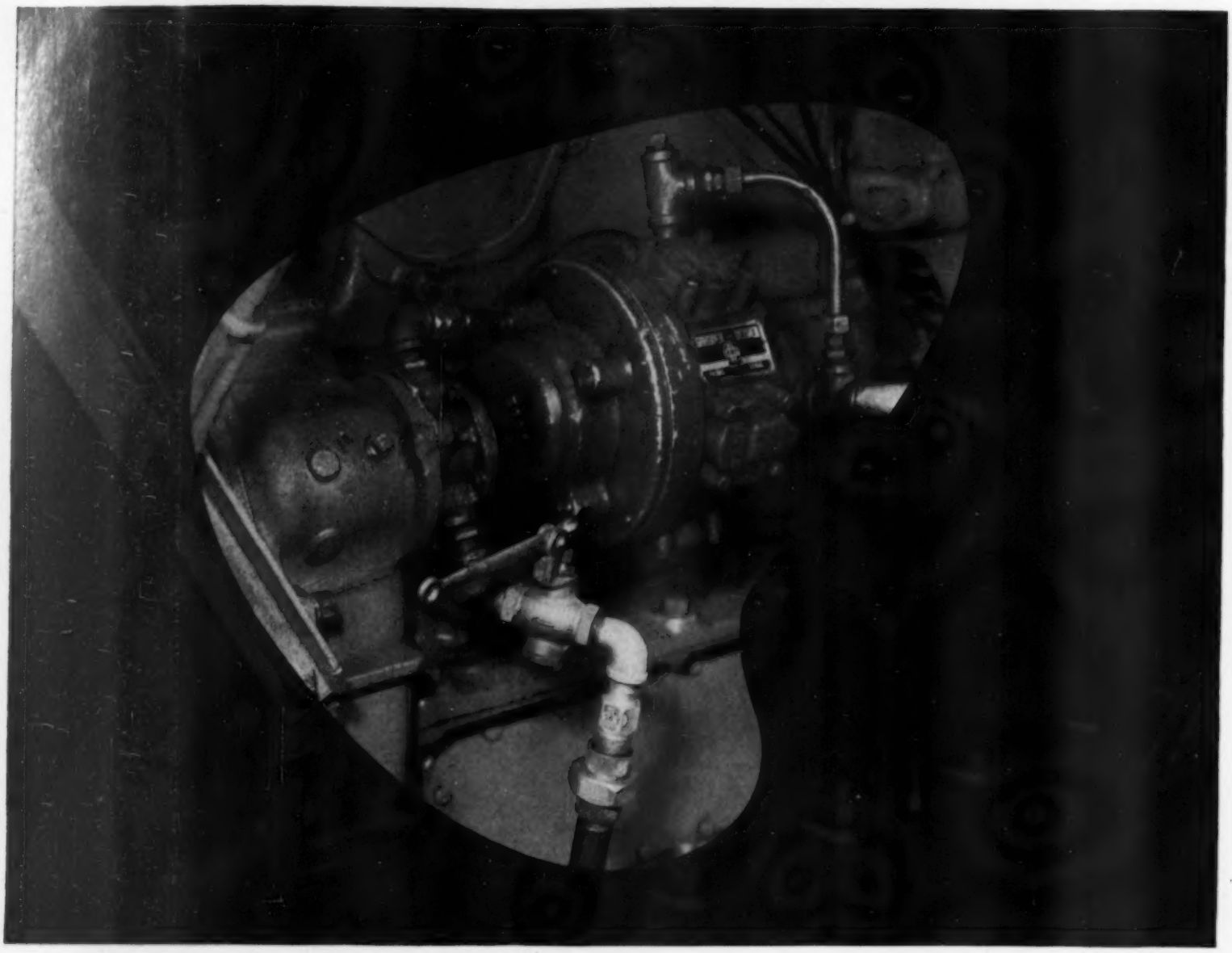
Because the *Texaco Ursa Oil* series is complete, you can count on a *Texaco Ursa Oil* that is just right to step up the efficiency of your engines and bring down your operating cost regardless of type, size, speed of your Diesels or fuel used. A Texaco Lubrication Engineer will gladly help you make the proper selection.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES



POWERFUL

GARDNER-DENVER AIR STARTER

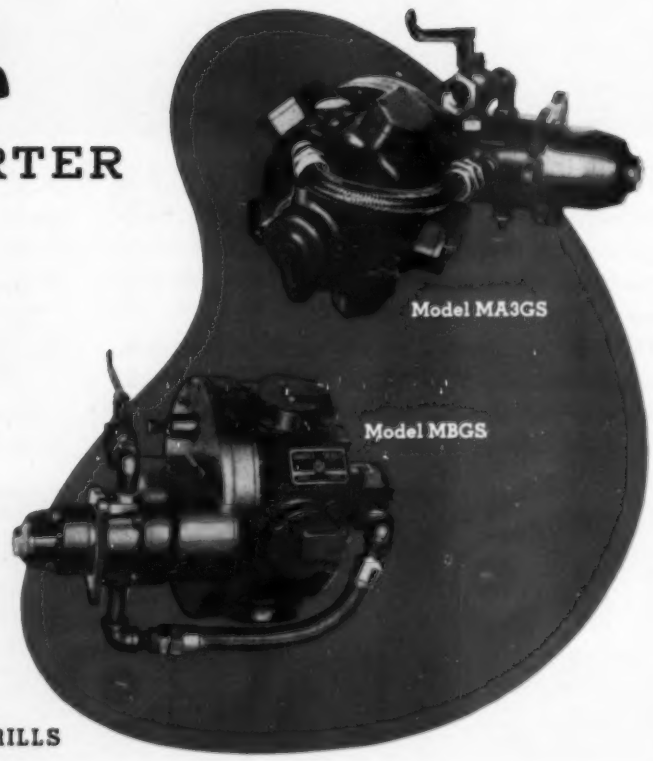
...takes a gentle hold

Pinion engages ring gear at low speed — saves strain and wear on gears.

...gives a fast turnover

Full cranking power develops automatically — assures fast, smooth diesel engine starting.

Send for Bulletin AM-1.



SINCE 1859

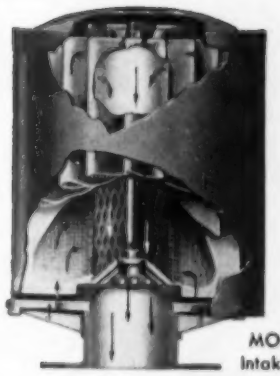
GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

DIESEL PROGRESS for October, 1953, Volume XIX, No. 10. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 816 North La Cienega Boulevard, Los Angeles 46, California. Rex W. Wadman, President. Subscription rate: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., authorized.

BEST ENGINE PROTECTION MONEY CAN BUY!



MODEL D
Intake Filter

STAYNEW INTAKE FILTERS keep shutdowns and repairs at an absolute minimum. Industrial engineers everywhere know that Staynew's *positive protection* lengthens engine life. They may cost more than ordinary intake filters, but with Staynew, you're assured of engines operating at top performance years longer. Staynew Intake Filters' extreme efficiency protects vital engine parts without carefully held maintenance schedules. And, efficiency actually increases with use. They're efficient over a wide range of loads, not affected by temperature changes, there's no oil carry over and no oil blow-out on free air unloading compressors. To keep equipment young *longer*, always specify Staynew.

Write today for Intake Filter Bulletin S.I.F.

Representatives in Principal Cities

STAYNEW INTAKE FILTERS

DOLLINGER PROTECTION MOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

12 Centre Park Rochester 3, N. Y.

ALL TYPES OF FILTERS
FOR EVERY INDUSTRIAL NEED

air Starters

save money and weight

Carolina Freight Carriers Corporation was the first to order the New Mack H61T C. O. E. Tractors equipped with Ingersoll-Rand Air Starting Motors. They now have 55 of the new units in service.

Over-the-road carriers everywhere are profiting from increased pay loads by using lightweight Ingersoll-Rand Air Starting Motors in place of the heavy duty electrical systems required for engine starting.

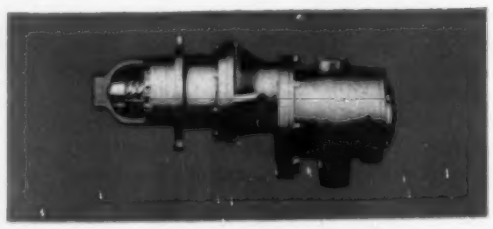
Here are a few of the advantages of Air Starting:

- **Regular air brake compressor provides the starting air.**
- **Tests by freight carriers show better than 50% reduction in starter and electrical system replacement costs.**
- **12 volt system instead of a 24 volt.**
- **Electrical maintenance costs have been reduced as much as 70%.**
- **In an emergency on those down hill grades that run for miles . . . the air supply can be passed into the brake system by a quick opening valve.**
- **Whatever the weather Ingersoll-Rand Air Starters are built to give you ample power for fast, sure engine starting - anywhere.**

Easily Installed—

Mounting Ingersoll-Rand Air Starters is no problem to any mechanic. They are designed for quick installation and minimum maintenance.

Ask your engine distributor to show you the I-R Air Starting Motor line, or write for Bulletin 5094A.



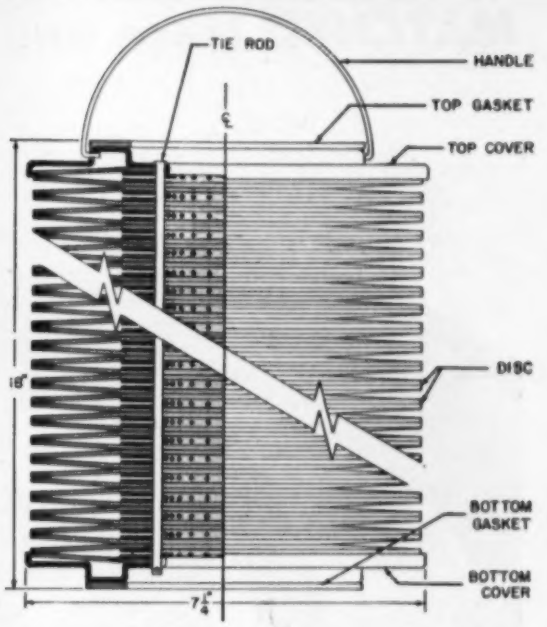
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

914-18A

This Exclusive New Cartridge

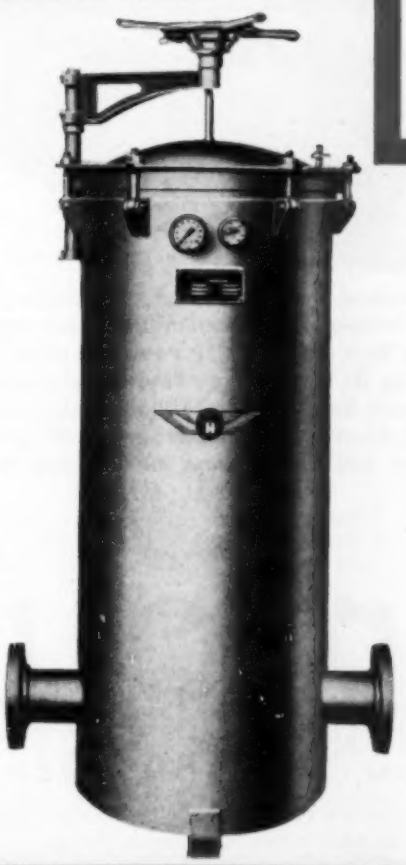
- **REMOVES PARTICLES 20 MICRONS OR SMALLER**
- **AT FULL-FLOW RATES**
- **WITH ONLY 5 P.S.I. INITIAL PRESSURE DROP** (with 150 S.S.U. Oil)



45 SQ. FT. OF FILTERING AREA are provided by the ingenious and exclusive design of each Flomaster 7 x 18 throwaway cartridge. This higher dirt-holding capacity means longer cartridge life for full-flow performance. As shown above, 135 disc assemblies comprise the filter element. Each assembly consists of two resin-treated paper discs and a separator. Passage ways in the separator allow full-flow of oil to the center manifold after passing through the disc. Each disc is sealed electronically at its periphery with a water and oil insoluble adhesive.

in the HOFFMAN FLOmaster

FULL-FLOW CARTRIDGE FILTER



UNIQUE, QUICK-OPENING COVER HAS 66% FEWER BOLTS — SPEEDS CHANGES

Easily removed swing bolts secure Flomaster cover to the tank. Neoprene gasket securely held by retaining groove in the head — no loose gasket to manipulate.

Hand wheel raises cover and support swings to a 45° angle with least effort . . . cartridges thus fully exposed for easy replacement.

For full protection of bearing surfaces you want full-flow filtration of the main lubricating oil stream. With that requirement in mind, Hoffman — builder of industry's most complete line of filtration equipment — has developed the Flomaster.

In ten sizes, for full-flow rates from 75 to 900 g.p.m., the Flomaster cartridge filter removes abrasive particles down to 20 micron size or smaller. Design and construction afford minimum pressure drop — only 5 p.s.i. with 150 S.S.U. oil. Inlet and outlet connections are diametrically opposite on the same center line to permit in-line piping. Oil inlet is in center of tank for unobstructed flow through the unit.

Write for New FLOmaster Bulletin A-873 and for Literature On These Other HOFFMAN Diesel Filters.

OIL CONDITIONERS	CARTRIDGE FILTERS	DEHYDRATORS
25 to 600 g.p.h.	7 x 18 size: Bulletin A-888	Remove Fuel, Water, Air
Bulletin A-667	11 x 18 size: Bulletin A-649	Bulletin A-668

TOPS IN VALUE ... SINCE 1903

IN CANADA:

Hoffman

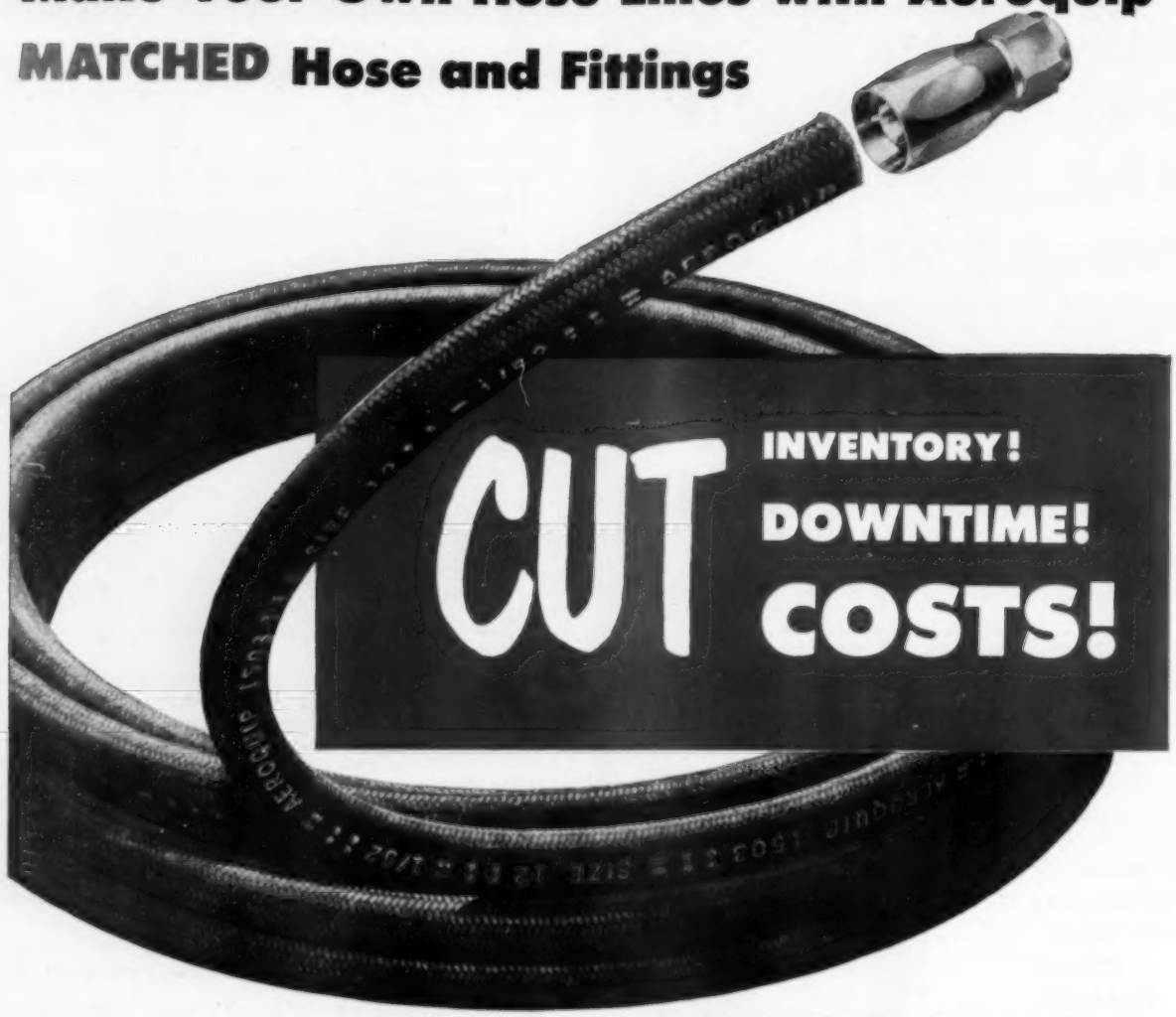
INDUSTRIAL FILTRATION EQUIPMENT & ENGINEERING

Industrial Filtration Division

U. S. HOFFMAN MACHINERY CORPORATION

227 LEMOYNE STREET, SYRACUSE 4, NEW YORK

Make Your Own Hose Lines with Aeroquip
MATCHED Hose and Fittings



Aeroquip Fittings are designed, developed, and produced to go with Aeroquip Hose. They form such a foolproof combination that Aeroquip *guarantees* performance. Thus, the hose lines made right in your own plant always measure up to Aeroquip's exacting standards of quality, the highest in the industry. A small supply of Aeroquip Bulk Hose and Fittings assures you of quick hose line replacements at all times . . . and Aeroquip Fittings are detachable and may be used again and again when making new hose assemblies.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA.
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AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oil R.R.

UNIT Diesel locomotive

SERVICE Transcontinental freight—grades to 1.8%

PERIOD 3 years

LOCATION Minneapolis, Minn., to Wenatchee, Wash.

FIRM Great Northern Railway

504,851 freight miles in 3 years without overhaul!

ONLY 0.002 INCH WEAR was miked on liners of this locomotive's engines when they were inspected after 504,851 actual miles. Lubricated with RPM DELO Oil R.R., the engines operated without trouble of any kind during 3 years of tough service hauling freight over the Continental Divide. Representative piston and liner, above right, shown as they appeared when taken from one of the engines, demonstrate good condition of parts after this extended service. All rings were free when engine was torn down. Overhaul was performed only because of time and mileage on engine, which was estimated to have idled the equivalent of 100,000 miles in addition to actual mileage. Besides low wear of liners, other wear measurements (inches) were only: Wrist Pin—0.001; Wrist Pin Bushing—0.0015; Carrier Bushings—0.0015; Oil Ring—0.003.

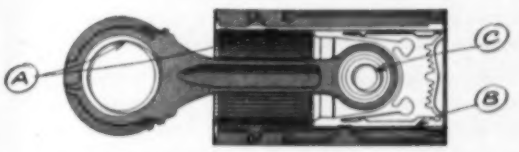
REMARKS: Great Northern Railway's diesels haul heavy freight up grades as severe as 1.8%. Engines operate in dust and heat in summer, snow and extreme cold in winter.

FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

RPM DELO LUBRICATING OILS

TRADEMARKS "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

Looking for solutions to all piston ring problems?

It will pay you to look to Koppers . . . here's why:

Every Diesel, gas engine, pump and compressor presents a different piston ring problem. So it pays to go to the source that can look for the solution from every angle . . . Koppers American Hammered!

In one complete, modern plant, American Hammered produces rings for every industrial application . . . in sizes ranging from less than one inch to ten feet in diameter. Ready to serve you are large foundries equipped for both static and centrifugal casting . . . a modern heat-treating plant . . . one of the largest and most up-to-date chromium plating plants . . . modern machine shops . . . an efficient engine test laboratory . . . a modern and complete piston ring research laboratory.

Outstanding product quality, assured by trained metallurgical and engineering staffs . . . supplemented by field engineers, thoroughly familiar with ring applications . . . results in efficient service and analysis of your specific problem. For experienced help with *your* problems, mail this coupon. No obligation, of course.

Compression Ring is a one-piece, quick-seating piston ring. One-piece construction gives maximum strength. Turned finish on outside diameter enables ring to conform readily to cylinder bore. Chemically treated surfaces promote rapid seating with freedom from scuffing or scoring during run-in. ½″ to 120″ diameters.

Porous Chromium Plated piston rings are manufactured by the exclusive Van der Horst process. Produced with a shallow porosity on the cylinder contacting surface, this ring facilitates break-in, holds and distributes oil during this critical period. Lasts four times longer and cuts cylinder wear up to 75%. 3½″ to 42″ diameters.

Conformable Oil Ring maintains constant unit pressure for positive oil control. Conforms readily to meet cylinder distortion because flexible cast iron member is pressed outward by abutment type spring which exerts uniform radial pressure around entire circumference. 4″ to 25″ diameters, ¼″ min. width.

Koppers Seal Ring has either one of two projecting bands of bearing bronze inserted in its cylinder contacting face. High unit pressure on narrow bronze bands takes quick initial seat, tends to prevent blow-by in both new or worn cylinders. Burnishing action of bronze on cylinder walls decreases scuffing and wear. 2″ to 30″ diameters.

Grooved Oil Cutter Ring has been adapted as standard equipment where oil control has previously been a major problem. Unique design incorporates two bevels for riding over oil on upstroke, plus a series of wide drainage slots. 1½″ to 25″ diameters.

Plus Ring Materials to fit every need, such as: K-IRON®, a high grade, closely controlled, individually cast grey iron used in majority of applications . . . and K-SPUN®, a malleable type iron, centrifugally cast for applications requiring high strength, high elastic modulus and superior impact resistance.

AMERICAN HAMMERED

Industrial Piston Rings

IN EVERY SIZE
OF EVERY TYPE
FOR EVERY PURPOSE

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INCORPORATED • BALTIMORE 3, MD.

This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers-Electrostatic Precipitators and Gas Apparatus.

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KOPPERS COMPANY, INC., *Piston Ring Dept.*
1680 Hamburg St., Baltimore 3, Md.
I'd like help with my piston ring problem.

Name.....

Company.....

Address.....

City.....State.....

NEW, Power-Packed AND READY TO GO!

NEW U-1091 natural gas power unit develops 187 net h.p. at 1400 rated r.p.m., 200 net h.p. at 1600 max. r.p.m.; maximum torque, 820 lbs. ft. @ 800 r.p.m.

NEW U-450—102 net horsepower at 1800 rated r.p.m.; 110 @ 2200 r.p.m.; maximum torque, 324 lbs. ft. @ 1200 r.p.m.

NEW U-406—91 net horsepower at 1800 rated r.p.m.; 98 @ 2200 r.p.m.; maximum torque, 279 lbs. ft. @ 1200 r.p.m.

NEW U-372—83 net horsepower at 1800 rated r.p.m.; 91.5 @ 2200 r.p.m.; maximum torque, 263 lbs. ft. @ 1200 r.p.m.

NEW U-269—62 net horsepower at 1800 rated r.p.m.; 72 @ 2400 r.p.m.; maximum torque, 191 lbs. ft. @ 1200 r.p.m.

NEW U-240—55 net horsepower at 1800 rated r.p.m.; 64 @ 2400 r.p.m.; maximum torque, 168 lbs. ft. @ 1200 r.p.m.

NEW U-220—50.5 net horsepower at 1800 rated r.p.m; 62 @ 2400 r.p.m.; maximum torque, 151 lbs. ft. @ 1200 r.p.m.

IH Announces Seven New International Engines

Seven new six-cylinder, carbureted, valve-in-head engines have been added to the International line, which now includes 18 models—diesel, gasoline or gas—ranging from 16.5 to 200 net horsepower.

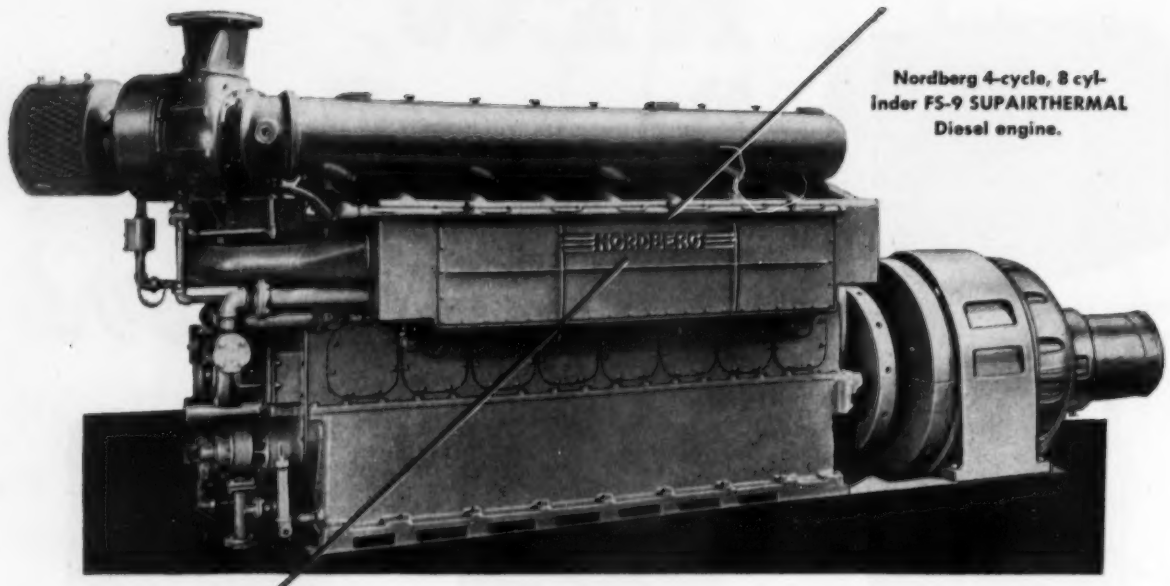
These new models are the result of more than 45 years of IH engineering and manufacturing experience building a complete line of heavy duty engines for tractors, trucks, construction and oil field equipment and individual power unit applications.

These new units have the durability, flexibility and economy to meet your requirements for lower cost performance. The unmatched network of IH district offices, parts depots, distributors and dealers puts complete service facilities practically at your door.

If you are an individual user of engines, it will pay you to see your nearest International Industrial Distributor or Power Unit Dealer for more complete information. If you are a manufacturer, your nearest IH district office will be glad to help you engineer these engines into the equipment you are building.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

POWER THAT PAYS — **INTERNATIONAL**



Nordberg 4-cycle, 8 cylinder FS-9 SUPAIRTHERMAL Diesel engine.

a world-wide reputation for Dependable Service and Nordberg uses Dependable

FEDERAL-MOGUL BEARINGS

Sleeve bearings in a wide range of designs and sizes; cast bronze bushings; rolled split-type bushings; bimetal rolled bushings; washers; spacer tubes; precision bronze parts and bronze bars.

Producers of America's largest diesels, Nordberg builds with skill and experience. Big, powerful, dependable in service, Nordberg engines are famed from Milwaukee to Madagascar, from St. Louis to Singapore.

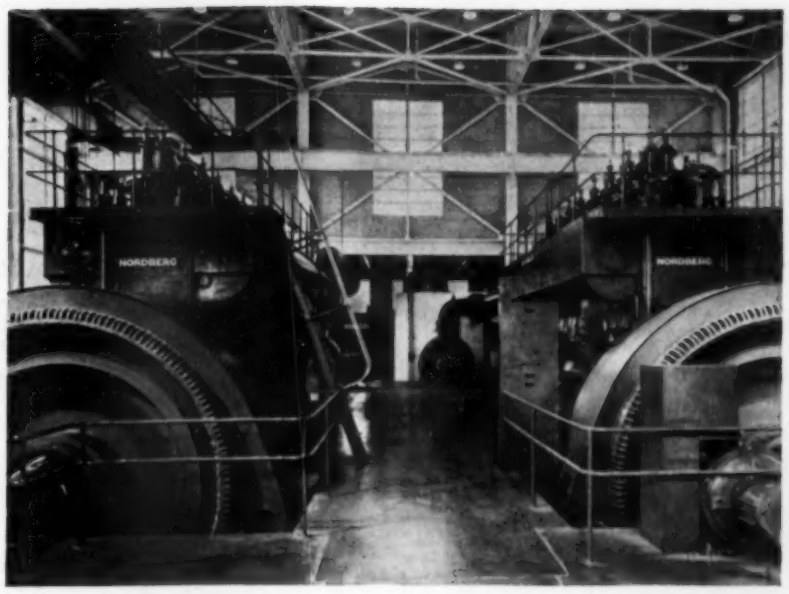
Federal-Mogul crankshaft and connecting rod bearings equip Nordberg's 9-, 13- and 16-inch bore engines. Helping put power to work *smoothly,* through silent sleeve bearings, has been a Federal-Mogul specialty since 1899.

FEDERAL Mogul

FEDERAL-MOGUL CORPORATION • 11039 SHOEMAKER AVENUE
DETROIT 13, MICHIGAN

FEDERAL-MOGUL

W. T. Elliott,
Power Plant Supt.,
says...



"We've Got Facts to Prove Rubilene's Superiority"

A lot of people depend on Mr. W. T. Elliott. For it's his job as Power Plant Supt. to see that the City of Denton, Texas has unfailing light and power 24 hours a day. To help live up to that responsibility, Mr. Elliott pampers his hard working Nordberg Duafuel® engines – makes sure they're lubricated with the finest oil available. He says, "We've been using Sinclair RUBILENE® since 1948 with *very satisfactory results*. Cylinder liner wear is only ⅓ of 0.001 inch per 1,000 hours running. Piston ring life is 16,000 hours of operation and we get 6,100 H.P. hours per gallon of oil... Facts like those have definitely sold me on RUBILENE."

Why not let the facts prove to you, too, RUBILENE is a superior lubricating oil. Phone your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

save wear and replacements

No other piston ring material
offers the unique combination
of advantages found in

Cyclan

the new high-strength, heat-treated,
resilient, long-wearing alloy by

Sealed Power

Cyclan's strength approaches that of steel. Cyclan's resilience and life-expectancy exceed those of cast iron. Cyclan equals the desirable bearing characteristics of cast iron. Cyclan retains all of these unique physical properties under extreme operating heat.

Cyclan piston rings will not break in super-charged engines. Gaps in Cyclan rings will not change. Cyclan rings have extraordinarily high impact value for shock resistance. They retain their resilience even after considerable distortion.

Cyclan may be chrome-plated

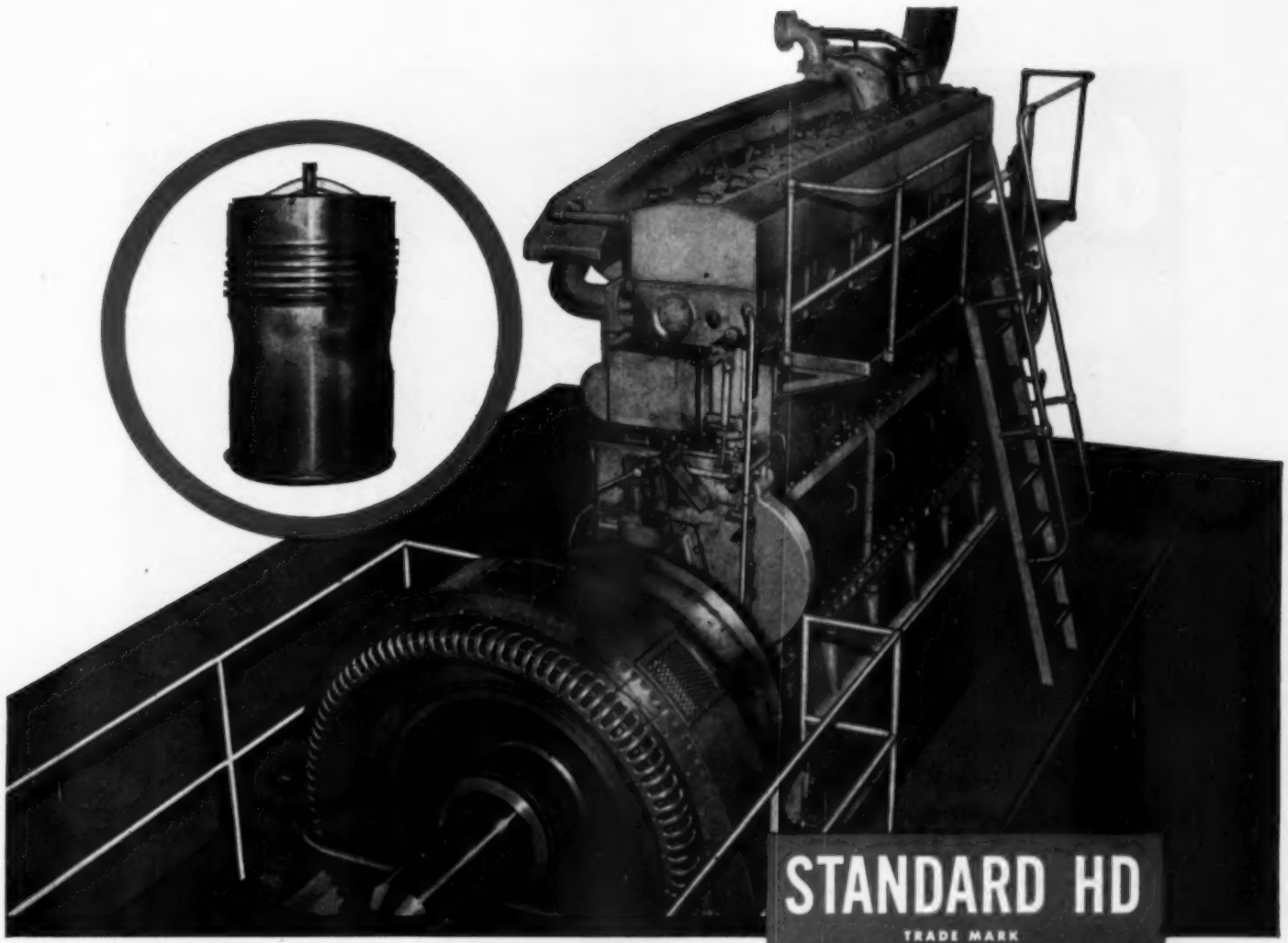
Cyclan piston rings are available for original equipment in heavy duty engines, with or without chrome plating. Chrome, of course, adds to wearing quality, but Cyclan's exceptional properties are such that it functions very efficiently without chrome plating. Some Cyclan sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES



21,000 hours young!

● This 1320-hp diesel engine has provided many hours of economical service for the City of Benson, Minnesota, Water and Light Department since it was installed in October, 1948. It has been operated on an average of 20 hours each day and has generated over 13 million KW at an average load factor of 75%.

In this hard-working diesel, the lubricating performance of STANDARD HD Oil has been outstanding, particularly in view of the fact that crude oil has been used as fuel. Visual evidence of the clean, protective lubrication provided by STANDARD HD is presented in the above unretouched photograph of a piston removed from the diesel after 21,000 hours' operation. Deposits are at a minimum; rings are free. The original fill of STANDARD HD has not been changed, yet a recent examination and analysis of the oil showed it to be in excellent condition.

Diesel operators throughout the Midwest are receiving service like this from STANDARD HD Oil. The Standard Oil lubrication specialist serving in your section of the Midwest will be glad to give you information about the use of STANDARD HD in plants near your own. Just phone your local Standard Oil office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY STANDARD *(Indiana)*

6 TUGS

Tug *Reliable* towing dredge and barges.

Tug *Waterford* maneuvers barge filled with silt dredged from the canal.

Powered by....

ATLAS DIESELS

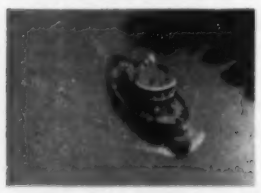
Used in maintenance operations on New York State Barge Canal

Photos by New York State Department of Public Works, Division of Operation and Maintenance of Canals & Waterways
V. L. Ostrander,
Division Superintendent
F. R. Lindsey,
Supt. of Operation & Maintenance
D. J. McNamara,
Supervising Master Mechanic

The New York State Barge Canal is a vital link in the nation's eastern transportation network, a dependable water route with a capacity of 20,000,000 tons of freight annually.

Operation and maintenance of this 801-mile waterway, between Lake Erie and the Hudson River, is the responsibility of the Division of Operation and Maintenance of Canals and Waterways. One of its biggest jobs is dredging the channel and towing away the deposits of silt and debris the dredges recover.

Tug *Urger*, (below) Tug *Lockport*



Six tugs powered by Atlas Diesels are employed at the task of towing and tending the dredges. The *Reliable* and the *Urger*, converted from steam to diesel operation, are equipped with six-cylinder, direct drive 325 rpm., direct reversible 320 hp. Atlas engines. The other four, christened *Waterford*, *Lockport*, *Erie* and *Pittsford*, were designed by Yourkevitch Ship Designs, Inc., New York, and built by American Boiler Works, Erie, Pennsylvania. Each is powered by a 135 hp., 900 rpm., reverse gear type Atlas Diesel with 2:1 reduction gear.

These six engines have proved their dependability and serviceability over a period upwards of four years. And the record is a typical one—the sort of performance you can expect from Atlas and Superior Diesels. For additional examples and descriptive bulletins write Springfield, Ohio, or any of the branches listed.

Tug *Erie*, (below) Tug *Pittsford*

Superior ENGINES — ATLAS Imperial DIESEL ENGINES

DIESEL • DUAL FUEL • GAS

ENGINE DIVISION
THE NATIONAL SUPPLY COMPANY
PLANT AND GENERAL OFFICES:
SPRINGFIELD; OHIO

Distributor of Lister Diesels in the U.S.A.

SALES AND SERVICE POINTS:
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Terminal Island, California
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Portland • Astoria, Oregon
Halifax, Nova Scotia
Vancouver, B.C. • Toronto, Ontario
Park Rapids, Minnesota
New York • Seattle • New Orleans

...with TYCOL lubricants on hand!

It pays to buy a "Diesel-Designed" Lubricant! ... It takes "something more than a motor oil" to counteract excessive wear in Diesel engines – and we proved it with Tycol Adeltran 40! In this instance, a Diesel engine was operated for one year with a competitive oil. An overhaul by the manufacturer turned up these conditions: all liners had to be replaced as well as piston rings ... 2 top compression rings were stuck and all rings were gummed up. After the switch to Adeltran (for the same operating period) liner wear was negligible ... filter life was considerably extended ... all rings were free and in excellent condition ... and owner reported an exceptionally clean engine base. For full details on Adeltran, contact your local Tide Water Associated office!

Over 300 Tycol industrial lubricants are at your disposal ... engineered to fit the job!

REFINERS AND MARKETERS OF VEEDOL ... THE WORLD'S MOST FAMOUS MOTOR OIL

TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
Philadelphia • Chicago • Detroit
Tulsa • Cleveland • San Francisco
Toronto, Canada

TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

"Helen L. Tracy"—Designed by Tams, Inc. Built at Levingston Shipyard, Orange, Texas. Powered with a GM Diesel engine—Model 16-278A.

FIRST GM Diesel-Electric Drive Tug for the Tracy Fleet

The "*Helen L. Tracy*" is the first General Motors Diesel-Electric Drive tug to join the Tracy Fleet. Other GM Diesel-powered tugs working for Tracy in New York are the "*Thomas Tracy*" and the "*William J. Tracy.*" For rugged service, where maneuverability and dependability count—it's General Motors Diesel-Electric Drive.

CLEVELAND DIESEL ENGINE DIVISION

GENERAL MOTORS • CLEVELAND 11, OHIO

ENGINES FROM 150 TO 3250 H.P.

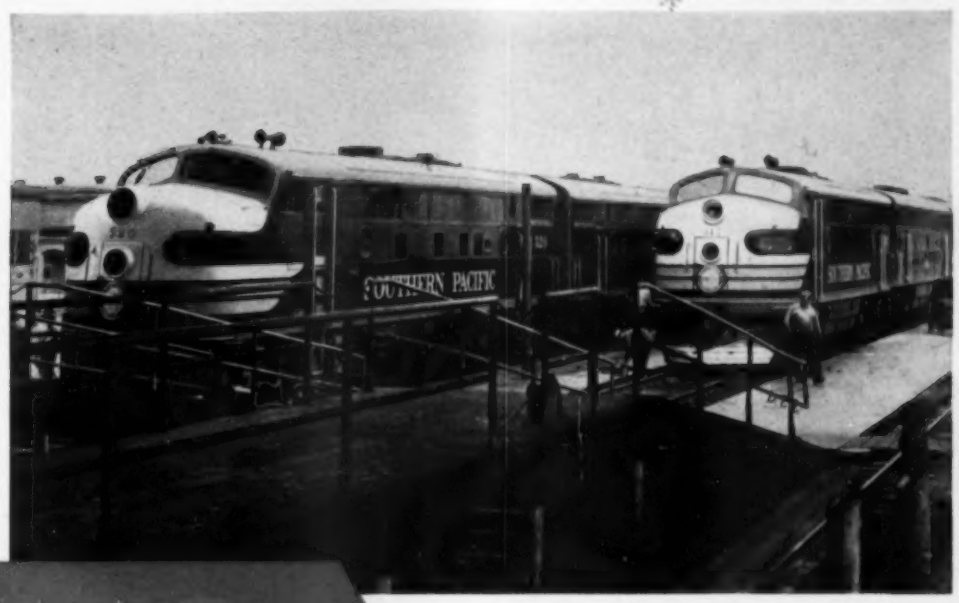
GM GENERAL MOTORS DIESEL POWER

Tie Up to GM Service

Sales and Service Offices: Cambridge, Mass. • Chicago, Ill. • Miami, Fla. • New Orleans, La. • New York, N.Y. Norfolk, Va. • Orange, Texas • San Francisco, Calif. • Seattle, Wash. • St. Louis, Mo. • Toronto, Ont. Vancouver, B. C. • Washington, D. C. • Wilmington, Calif.

The oil with *3-way action*

that keeps railway Diesels clean



1 Fights piston ring belt deposits (effective detergent action).

2 Resists sludging (high stability).

3 Prevents hard deposits on piston crowns (base stock quality and refining methods).

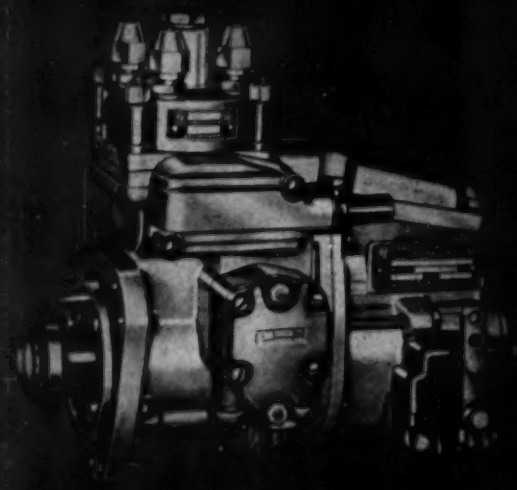
GULF DIESELMOTIVE OIL

These are the reasons why Gulf Dieselmotive Oil protects against the accumulation of harmful deposits on compression and oil-control rings, on piston crowns, and in ports. Because engines lubricated with Gulf Dieselmotive Oil stay cleaner, they use less oil and require ring jobs less often. This means lower maintenance costs and less time off the road. For further information, write, wire, or phone your nearest Gulf office.

GULF OIL CORPORATION
GULF REFINING COMPANY
PITTSBURGH 30, PENNSYLVANIA

GULF

greatest single advance in diesel fuel injection...



AMERICAN BOSCH

American Bosch single-plunger multi-cylinder
pumps have literally revolutionized
the concepts of diesel fuel injection.

For power in emergencies

Delco Generators

Ideal for use with Diesel power, Delco generators provide a power range of 20 kw through 200 kw, A.C. or D.C., 1200, 1500 and 1800 rpm.

Hospitals, public buildings, factories, construction jobs, circuses, carnivals, and many others must frequently call upon such independently powered utilities for stand-by or portable use.

Delco generators deliver dependable power—both adequate and unfailing.

Adaptable to most engines. Flexible driving disc. Standard S.A.E. mounting.

Any of the sales offices listed below will be glad to supply detailed information.

DELCO PRODUCTS

DELCO DAYTON OHIO

Division of General Motors Corporation, Dayton, Ohio

A.C. GENERATORS

20 kw through 150 kw at 1200 rpm
20 kw through 200 kw at 1800 rpm

D.C. GENERATORS

20 kw through 100 kw at 1800 rpm
20 kw through 75 kw at 1500 rpm
20 kw through 60 kw at 1200 rpm

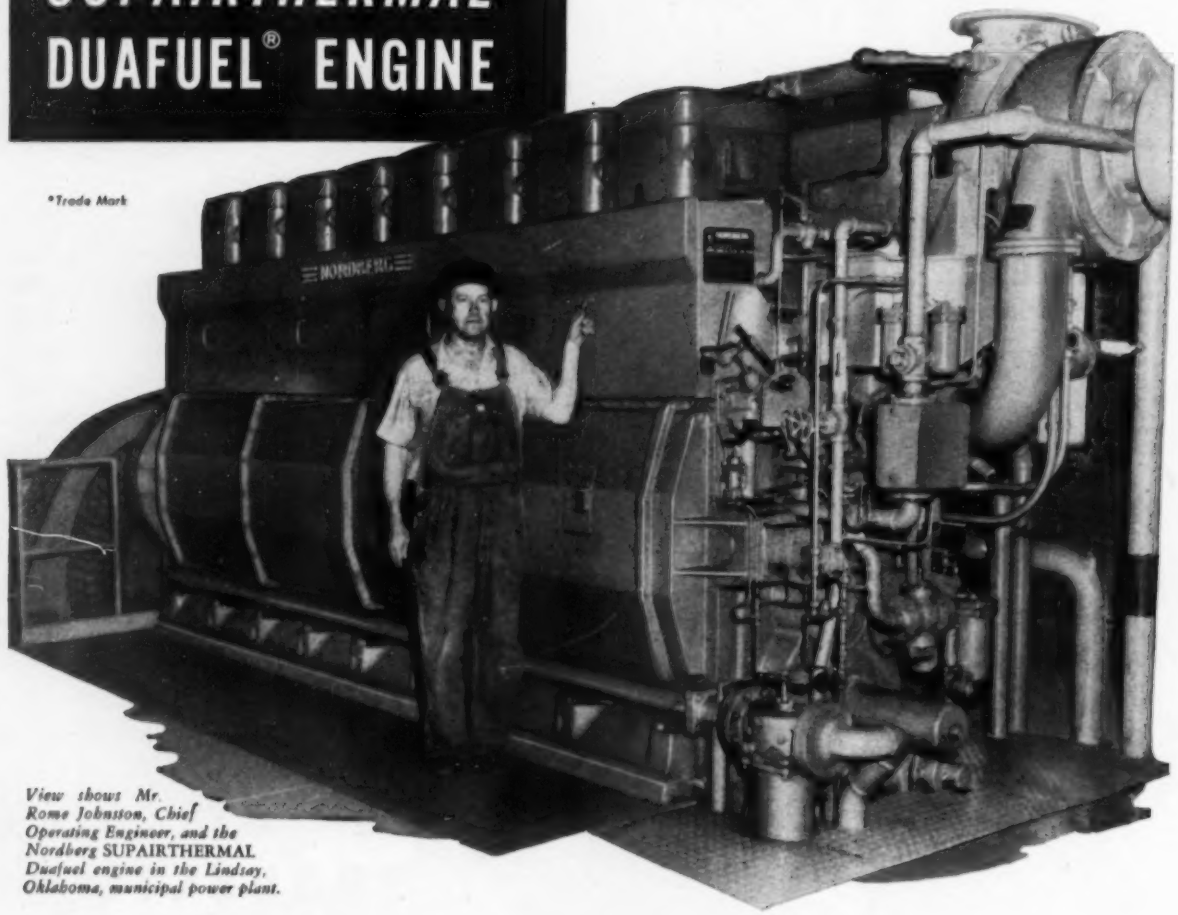
SALES OFFICES:

ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HARTFORD • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO

NORDBERG *SUPAIRTHERMAL** DUAFUEL® ENGINE

HIGH EFFICIENCY INCREASES POWER PLANT PROFITS

*Trade Mark



View shows Mr. Rome Johnston, Chief Operating Engineer, and the Nordberg SUPAIRTHERMAL *Duafuel engine in the Lindsay, Oklahoma, municipal power plant.*

AT the Lindsay, Oklahoma, municipal plant, a Nordberg *SUPAIRTHERMAL* Duafuel engine is generating energy at an average fuel cost of 2.5 mills per kwh at 58.5 percent average load factor. This Nordberg four-cycle, 8-cylinder engine is rated 1425 horsepower, 1000 kilowatts, at 450 rpm.

Since this 13" x 16½" *SUPAIRTHERMAL* engine was placed in service, it has been operating over 98 percent of the time. Data compiled by C. H. Guernsey & Co., consulting engineers, show savings in fuel costs of over $1200 per month as against straight oil operation. In addition, this engine has maintained a lubricating oil economy of approximately 18,000 HP/hrs. per gallon.

Because of its compact design, the 1425 hp Nordberg *SUPAIRTHERMAL* engine was installed in the very limited floor space formerly occupied by a 200 HP unit, eliminating the necessity for costly building expansion.

When *you* need more economical, compact power, investigate the tested and proved advantages of Nordberg *SUPAIRTHERMAL* engines, in sizes from 535 to 4260 HP. *For details, write for Bulletin 191.*

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P833

Saving $1600 a year

on clutches alone

Model MDT Plymouth locomotive pulling a 320-ton steam locomotive to the scrap heap. This 35-ton locomotive is equipped with an Allison TORQMATIC Converter which smoothly transmits power from a 220 h.p. Diesel engine.

In September 1951, Pittsburgh Ferrous Products Company bought a TORQMATIC-equipped Plymouth locomotive to replace one with a mechanical drive. With his old locomotive, this scrap dealer had to replace clutches four times a year—at $400 each. But with an Allison TORQMATIC Converter transmitting power in the new unit—*a saving is effected of $1600 a year on clutches alone*, plus additional savings in labor and availability.

Since it was delivered, this locomotive has worked more than 4000 hours with absolutely no down time. The small 35-ton unit has pulled loads as high as 1400 tons. With the TORQMATIC Converter smoothly transmitting power, sudden jerks and jolts are eliminated, cutting wear on car couplers, scrap cars and the locomotive itself.

The Fate-Root-Heath Company, makers of Plymouth locomotives, is one of many manufacturers who install Allison TORQMATIC DRIVES in their products to help their customers get more work at less cost. For more information on how you can cut your heavy-duty equipment operating costs, ask your equipment dealer, manufacturer or write:

ALLISON TORQMATIC CONVERTER

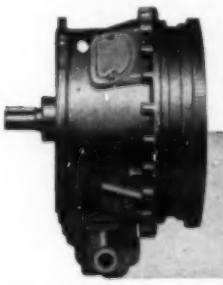
SIMPLE DESIGN—one-piece cast converter elements—minimum maintenance

COMPACTNESS simplifies installation

DESIGNED for power applications in the 75 to 400 h.p. range

LONGER EQUIPMENT LIFE—absorbs shock, eliminates engine lugging, cuts maintenance costs

ALLISON DIVISION OF GENERAL MOTORS
Box 894DD, Indianapolis 6, Indiana

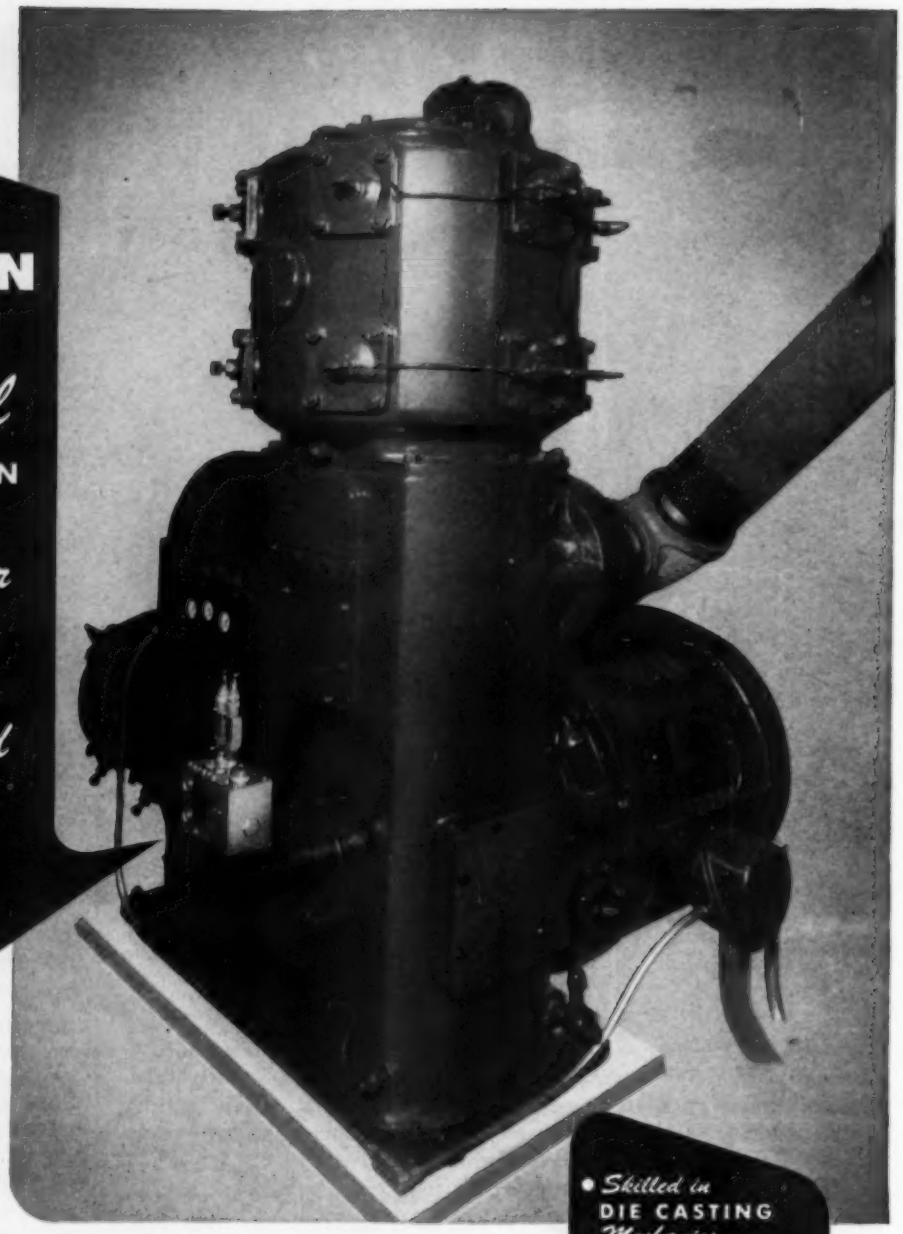


Allison **TORQMATIC DRIVES**

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES • TRUCKS • TRACTORS • SCRAPERS • SHOVELS • DRILLING RIGS • LOCOMOTIVES

MADISON -KIPP *fresh oil* LUBRICATION

fed under pressure by the measured drop!



Illustrated, the Madison-Kipp Model SVH Lubricator on an Ingersoll-Rand XLE Compressor.

- *Skilled in* DIE CASTING *Mechanics*
- *Originators of Really High Speed* AIR TOOLS
- *Experienced in* LUBRICATION *Engineering*

....STANDARD EQUIPMENT ON COMPRESSORS, WORK ENGINES AND MACHINE TOOLS....

Oil under pressure fed drop by drop from a Madison-Kipp Lubricator will definitely increase the production potential for years to come when applied as original equipment on new machine tools, work engines and compressors. There are six popular models for every application. Write for special engineering data for your particular requirement.

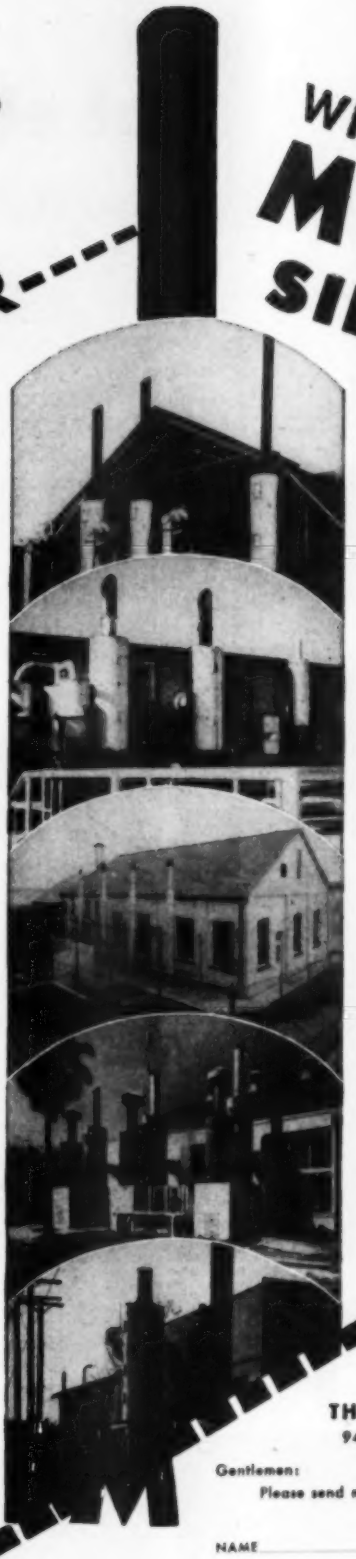
MADISON-KIPP CORPORATION

215 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

YOU'RE ALWAYS A GOOD NEIGHBOR---- WITH MAXIM SILENCERS

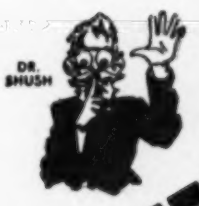


When horsepower has to work 24 hours a day in close proximity to residential and business areas, the best exhaust silencing you can get is just downright necessary.

That is one very good reason why public relations-conscious municipal plants from coast to coast choose Maxim Silencers.

Maxim Silencers are backed by longer manufacturing experience, more field use, and the broadest engineering and research background in acoustics available.

Because silencing needs vary so greatly, good engineering advice to start with is almost as important as the product. Maxim engineers know municipal plant problems, and can be of real assistance in planning efficient installations. They are at your service.



Consult

MAXIM

THE MAXIM SILENCER COMPANY
94 Homestead Ave., Hartford 1, Connecticut

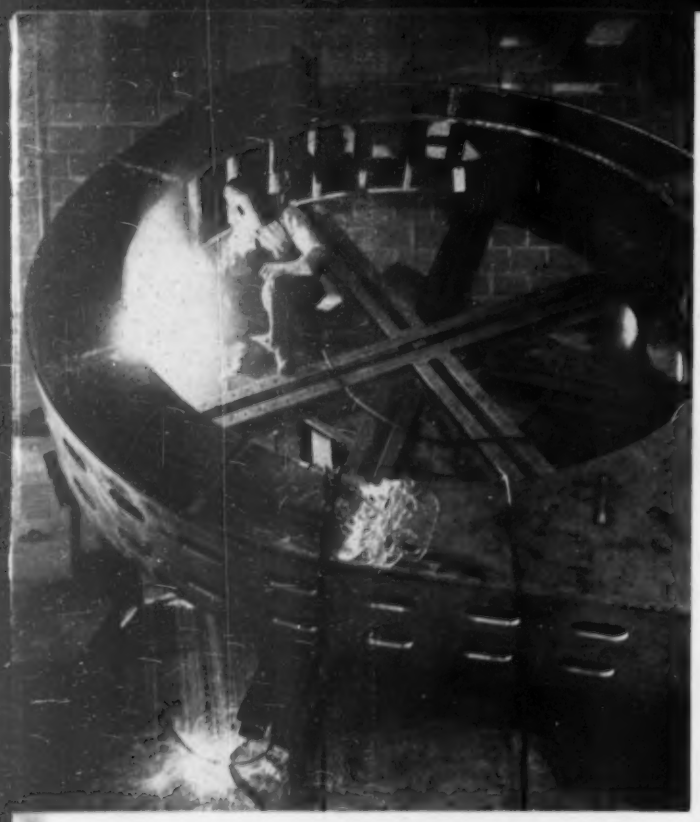
Gentlemen:
Please send me your bulletins on Exhaust and Intake Silencers.

NAME _____

COMPANY _____

ADDRESS _____

_____



To save you time, we've got it in rhyme!

The abc's of electric generator construction

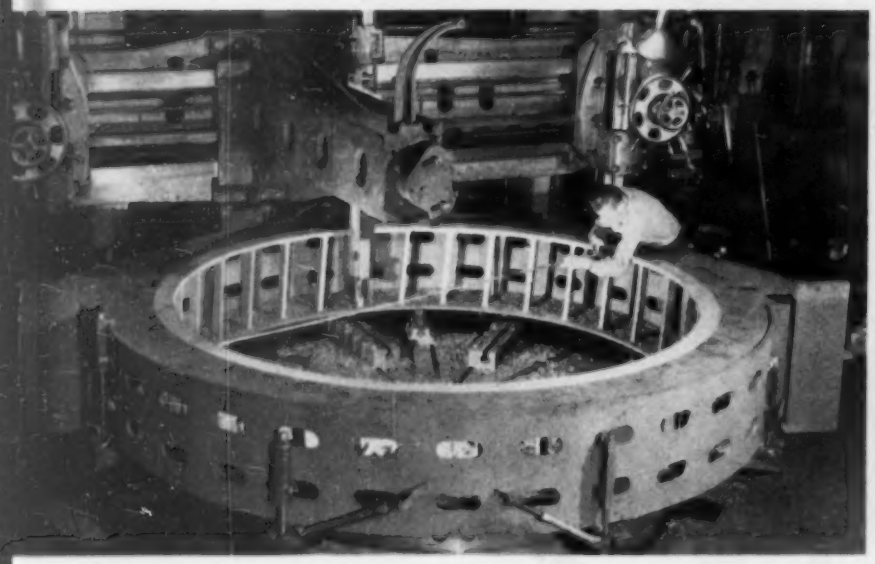
Here's an action picture sequence of a big E-M Custom-Built Synchronous Generator in construction. Step by step, you can observe the meticulous care given to every construction detail by E-M engineers and craftsmen. The little rhymes will call your attention to the key points in each picture.

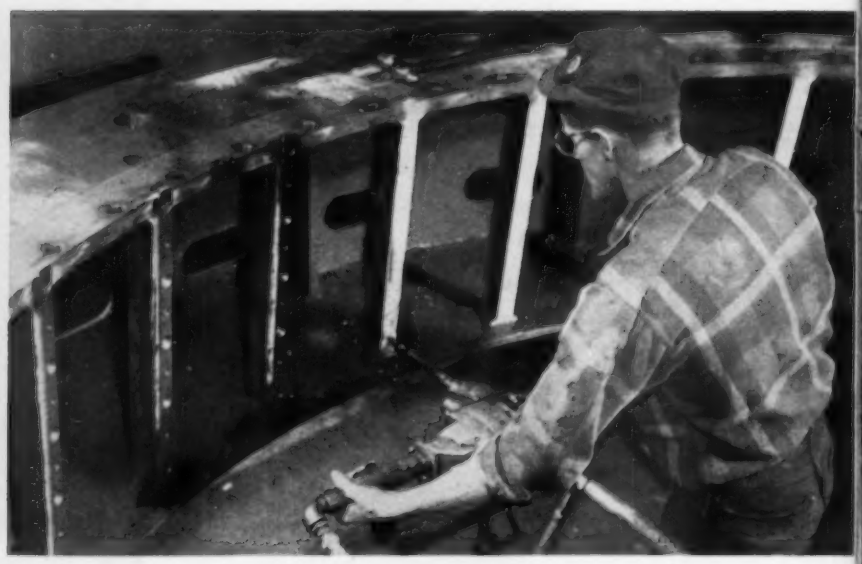
This particular E-M Generator, built for the Central Kansas Electric Coop., Inc., Great Bend, Kansas, is rated at 4250 kva, 2400/4160 volts, 257 rpm. Your plant's generator requirements may not be this sizeable, but it is a point of pride at E-M that the same careful attention is given to *every* Generator, large or small, which bears the E-M nameplate.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

a

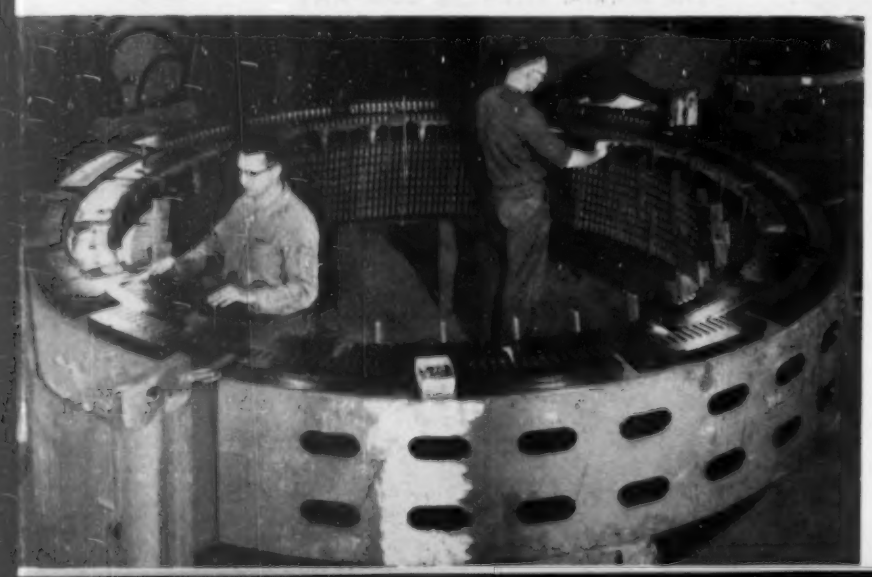
A's for All-welded, this frame for long duty,
Unique in its strength, a self-contained beauty.
All welding is done before other work starts,
So it's free from distortion as we add other parts.





b

Precise Boring is next on this tough stator frame . . .
The air gap stays uniform, always the same.
The resultant gain is a point to remember—
High quality power from Jan. through December.



c

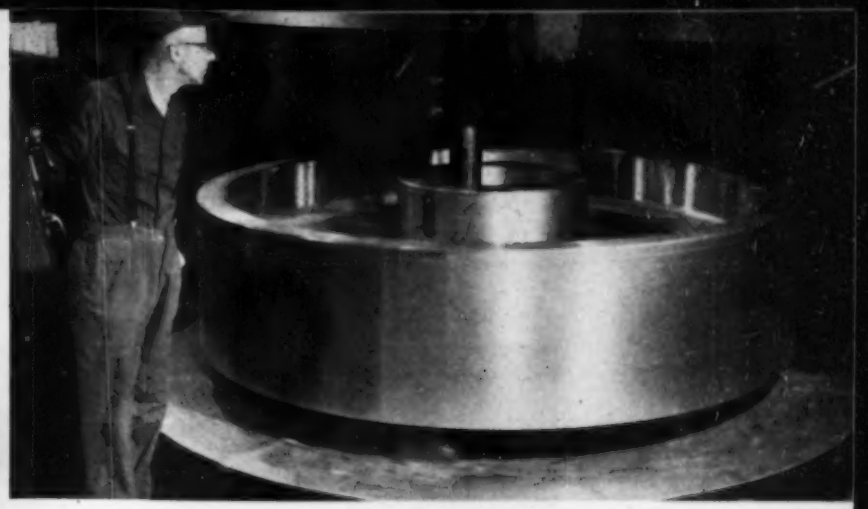
Care in Construction means no through-bolts here;
Unified components are strikingly clear.
And dovetailed keys support each lamination . . .
This is convincing strength demonstration!

d

Diligence you'll find in the lamination stacking,
Permanently in place . . . what meticulous packing!
Core slots are "skewed" with strict adherence
To lowest possible 'phone interference.

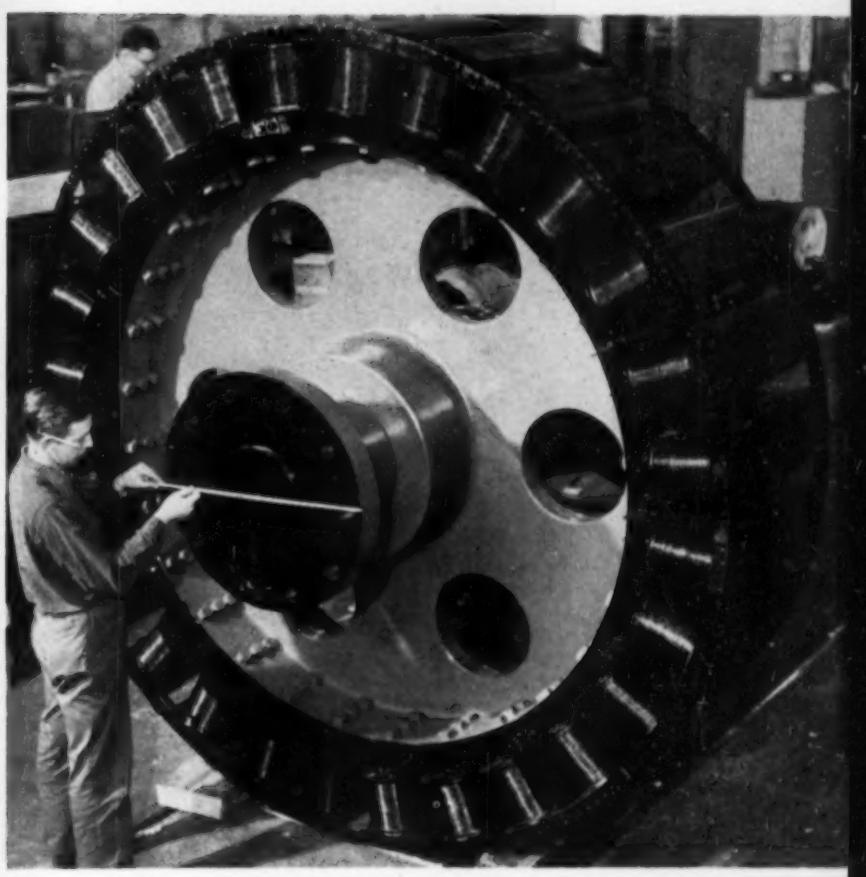
e

The winding Excells, like the lashing of coil ends . . .
No wobbles, no weaving, no movements, no bends.
Special lashing makes coils resist urges
To distort from lightning or switching surges.



f

F is for Flywheel Effect, which increases first-rate
With a cast rotor spider, a true heavy-weight.
And . . . so important in each power station . . .
You get much better parallel operation.

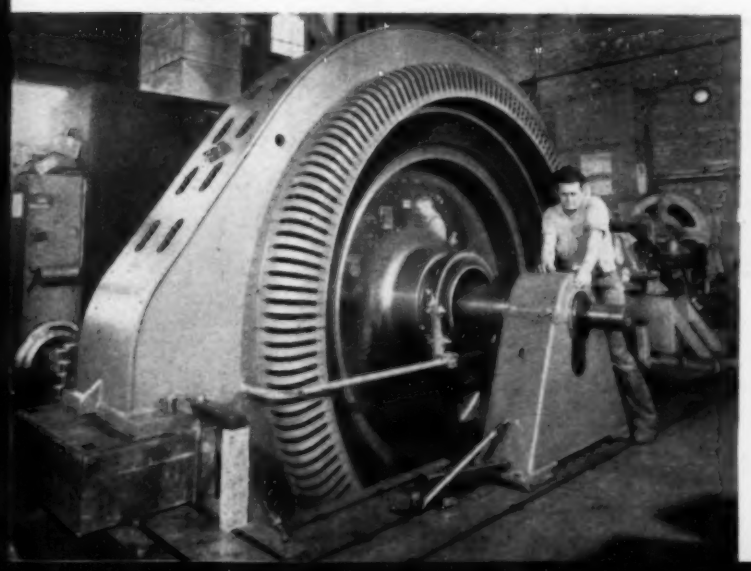


g

Generatorly speaking, even after crystal-gazing
We decided we feature the best method of brazing.
It means better damping, and it's no small sensation
To notice improvement in generator operation.

h

H is for Handsome . . . the rotor complete.
It's a clean, shining beauty that just can't be beat!
Every part is just right . . . every part will stay tight;
Good news for the user . . . good power . . . good light!



i

Inspection is thorough, when we've done all the rest.

For each E-M machine stands a rigorous test.

When it's installed in your plant, you're assured it can take it . . .

It's bound to be rugged, for it had experts to make it!

We suggest, with full confidence, that you contact your nearest E-M sales engineer when plant modernization or new plant planning comes up. He knows electric power generating equipment from A to Z, and can help you materially in getting dependability and extra value in equipment.

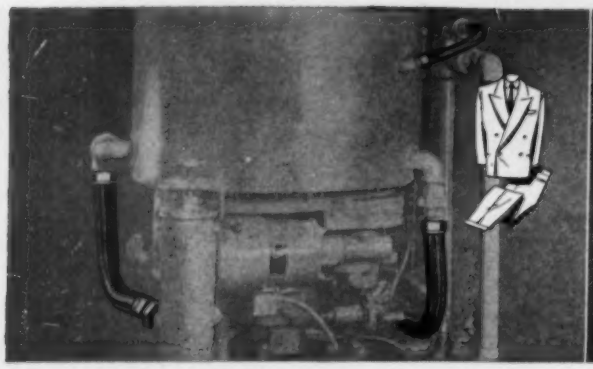
Also—be sure to write the E-M factory for your free copy of Publication No. 196, "Your E-M Guide to Profitable Installations of Modern Generators." Electric Machinery Mfg. Company, Minneapolis 13, Minnesota.

E-M

2200-TPA-2139

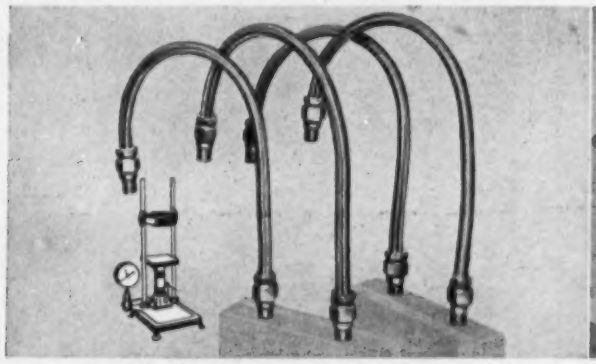
SPECIALISTS IN *Custom-Built* GENERATORS

Pick an idea—lick a design problem...

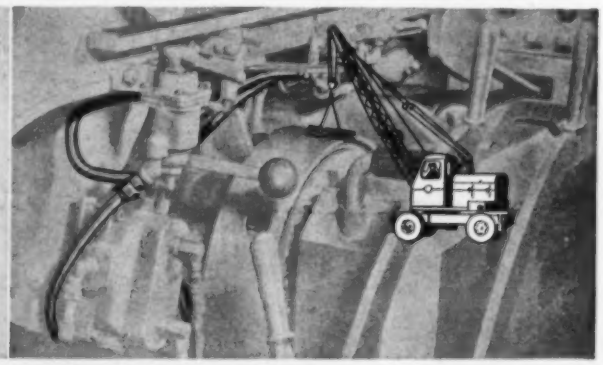


END VIBRATION AND LEAKAGE. Titeflex® metal hose, used as fill and drain lines of SEC Synthetic Cleaning Units, kills vibration and prevents solvent leakage at fittings. Tough, wear-and-corrosion-resistant Titeflex is just as effective in handling steam, oil, lubricants, fuels, gases, brine, acids, compressed air or oxygen. Design and construction of Titeflex assure trouble-free performance. Excellent for projects involving extreme configurations.

CONTROL CRITICAL PRESSURES. How would you connect 280 cylinders of fire-extinguishing carbon dioxide at 850 psi to line? Walter Kidde & Company licked this problem with Titeflex flexible metal hose which met all insurance standards and withstood rigid application requirements. Titeflex also conveys hundreds of different fluids under as many different temperature and pressure conditions. Resists corrosion, vibration, physical abuse.



CONDUCT STEAM SAFELY. Plates for Carver Laboratory Press carry steam up to 200 psi (nearly 400°F.) for heating—water for cooling. The connections are flexible, pressure-safe Titeflex. Braiding gives extra strength. Added problems of vibration, pulsation, continuous movement, corrosion or abrasion make Titeflex invaluable in scores of other applications.



FIGHT FATIGUE AND WEAR. Titeflex metal hose eliminated maintenance on air control lines of Unit Mobile Cranes. All-metal construction, with braiding woven directly upon the hose, provides great strength and resistance to vibration, corrosion, wear and abuse. Flexibility of Titeflex permits simplified assembly even where space configurations are problems.

THE USES FOR TITEFLEX® seamed flexible metal hose and Uniflex seamless flexible metal hose are limited only by engineering ingenuity. And Titeflex design engineers—working *with* customers—develop new applications daily. Somewhere in your plant or on your products Titeflex can improve operation and maintenance—or simplify a design problem. Our *new 48-page Metal Hose Catalog* No. 200 shows you how and why. To get your free copy, simply mail the coupon.

Let Our Family of Products Help Yours

Titeflex

✓ Check products you are interested in.

☐ SEAMED AND SEAMLESS METAL HOSE

☐ PRECISION BELLOWS

☐ IGNITION HARNESS

☐ IGNITION SHIELDING

☐ ELECTRICAL CONNECTORS

☐ RIGID AND FLEXIBLE WAVE GUIDES

☐ WIRING SYSTEMS

☐ FUSES

TITEFLEX, INC.
501 Frelinghuysen Ave.
Newark 5, N.J.

Please send me without cost information about the products checked at the left

MAIL COUPON TODAY

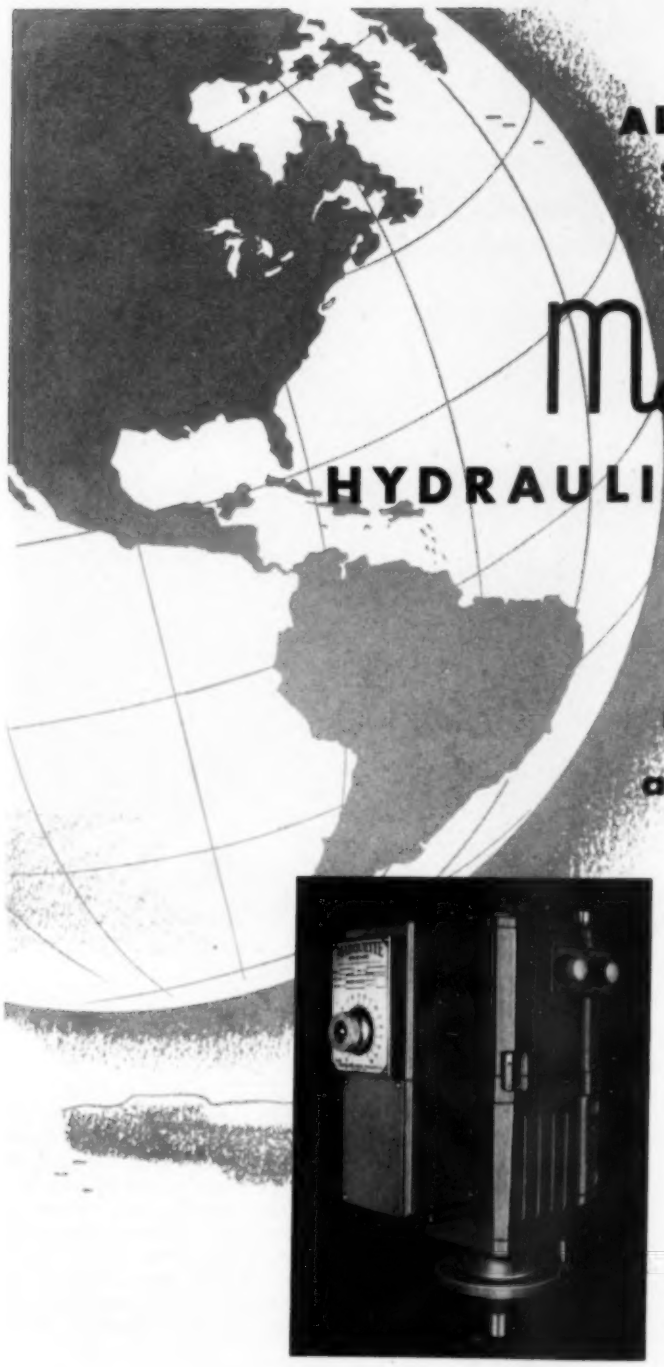
NAME _____

TITLE _____

FIRM _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____



ALL
'ROUND
THE WORLD...

Marquette
HYDRAULIC GOVERNORS

regulate the speed
of Diesel engines in
municipal, industrial
and utility power plants

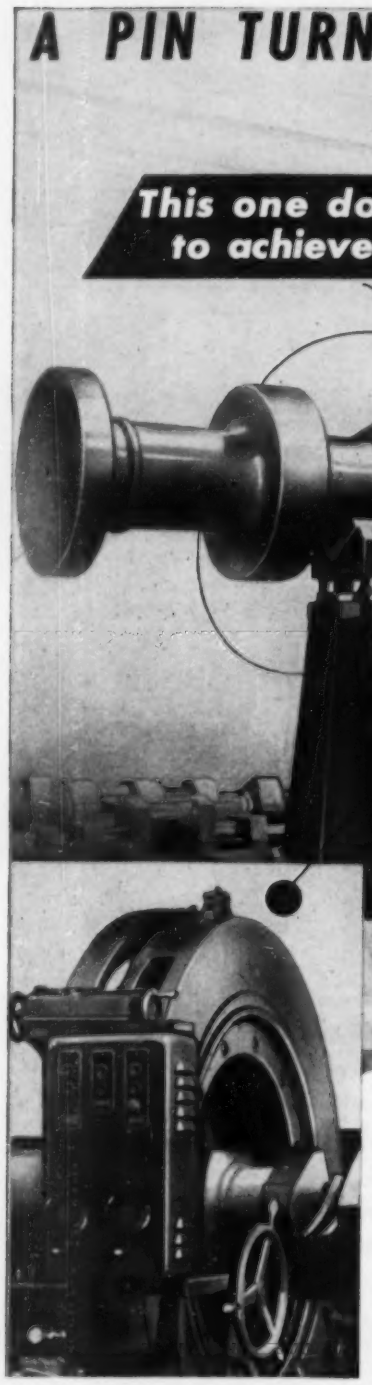
Many hundreds of
Marquette Hydraulic Governors
today are regulating
various American and foreign
makes of Diesel engines
installed in power plants
in the United States
and in every foreign country.

The Marquette
METAL PRODUCTS CO.
CLEVELAND 10, OHIO
SUBSIDIARY OF CURTISS-WRIGHT CORPORATION

Also Manufacturers of:
ROLLER BEARING TEXTILE SPINDLES
WINDSHIELD WIPERS FOR AIRCRAFT
FUEL OIL PUMPS AND INJECTORS
PRECISION PARTS AND ASSEMBLIES
ROTARY HIGH PRESSURE OIL FIELD PUMPING MACHINERY

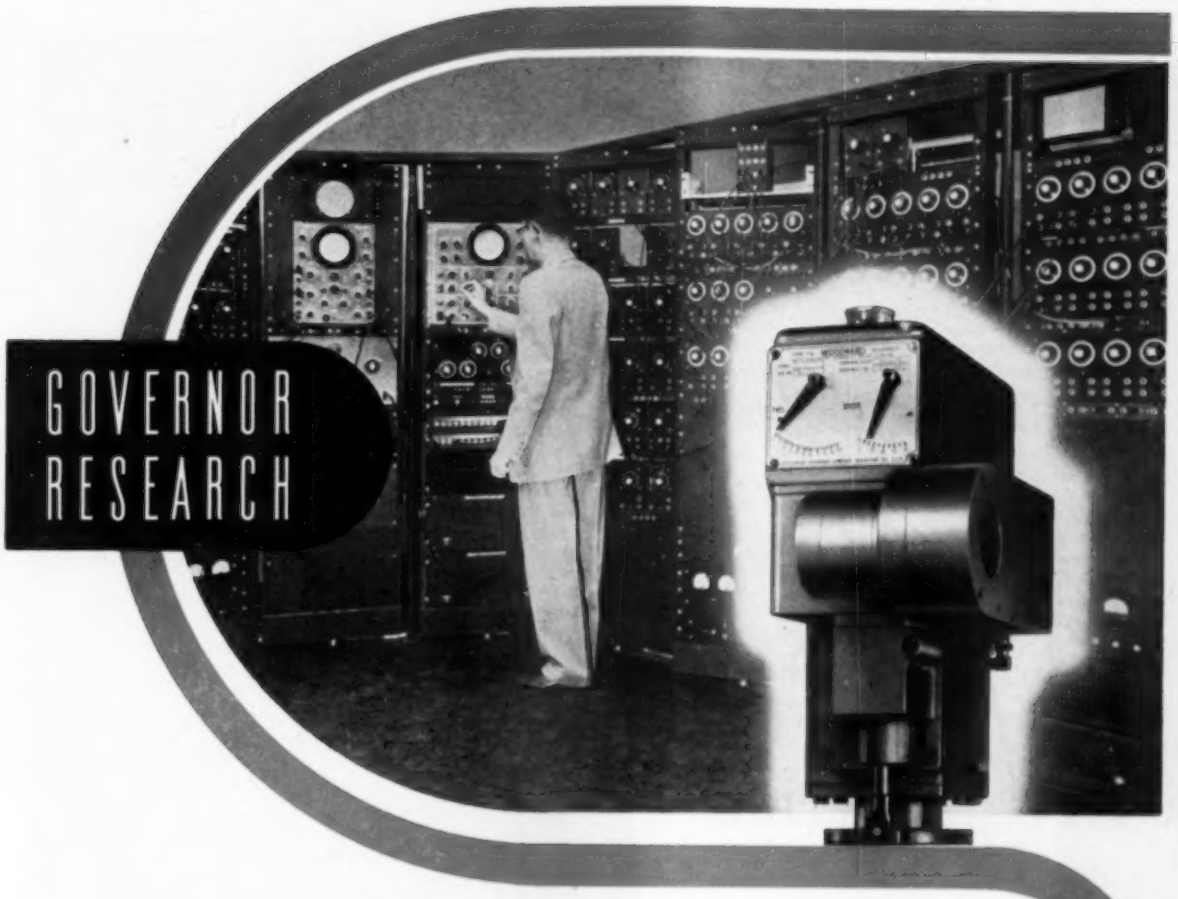
A PIN TURNING MACHINE that revolves AROUND the WORK?

This one does at ERIE FORGE — to achieve MAXIMUM accuracy!



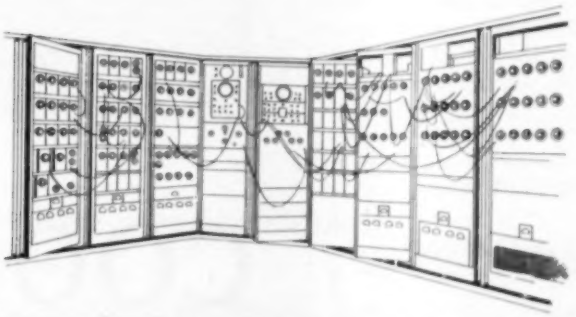
AT ERIE FORGE & STEEL CORPORATION you'll find the most accurate pin turning machine in the country. The crankshaft is held motionless . . . the machine revolves around the work! The crankshaft is accurately aligned, then bolted down . . . it cannot move off center! As this 50,000 pound crankshaft is automatically moved, from throw to throw, through the machine opening, it is finish turned to close tolerances and a mirror finish. This exceptional degree of accuracy is standard practice at Erie Forge & Steel Corporation. Every operation—from ingot to finished crankshaft—is under one control, one responsibility. Consult with us on your next requirements involving crankshafts, connecting rods or allied items.

ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



GOVERNOR RESEARCH

Our analogue computer is a mathematical tool used by our research staff to determine the best governor design for a particular application. The instrument itself is an electrical assembly incorporating numerous vacuum tube circuit components. The mathematical solutions appear as line images on the faces of oscilloscope tubes.



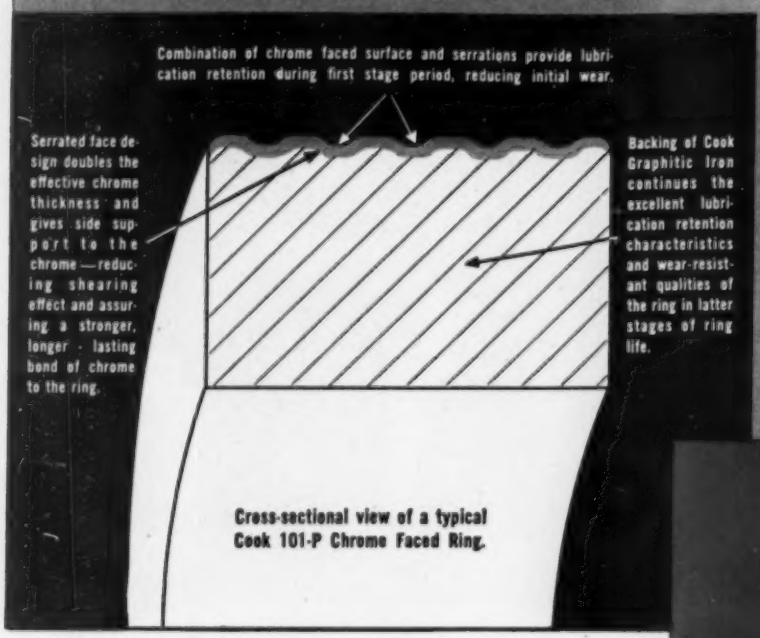
WOODWARD GOVERNOR COMPANY
ROCKFORD, ILLINOIS

World's oldest and largest manufacturer of hydraulic governors for prime movers.

It costs little to—

GIVE YOUR DIESELS THE EXTRA LONG PROTECTION of

COOK *Chrome Faced* RINGS


Combination of chrome faced surface and serrations provide lubrication retention during first stage period, reducing initial wear.
Serrated face design doubles the effective chrome thickness and gives side support to the chrome—reducing shearing effect and assuring a stronger, longer - lasting bond of chrome to the ring.
Backing of Cook Graphitic Iron continues the excellent lubrication retention characteristics and wear-resistant qualities of the ring in latter stages of ring life.

Cross-sectional view of a typical Cook 101-P Chrome Faced Ring.

ALL THE FEATURES OF A CUSTOM-BUILT PISTON RING have been incorporated into the design of Cook Chrome Faced Rings to give you better service, less cylinder wear and longer life. *Yet—they cost no more than ordinary chrome rings!*

It pays to specify Cook Chrome Faced Rings whenever chrome-plated rings are required. They'll rapidly pay for themselves through savings in maintenance and operating expense.

Our field engineers will be glad to show you where and how Cook Chrome Faced Rings can be used to best advantage in your own engines. Call them in. For full information, just fill out the coupon below.

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DIESEL and GAS ENGINE PROGRESS

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FRONT COVER ILLUSTRATION

The *Jimmy D*, 24 ft. express cruiser owned by the Evans Boat & Equipment Co. of Seattle. She is pictured on her trial run, successfully testing her new, compact GM Detroit Diesel Div. Model 6-[illegible] engine.

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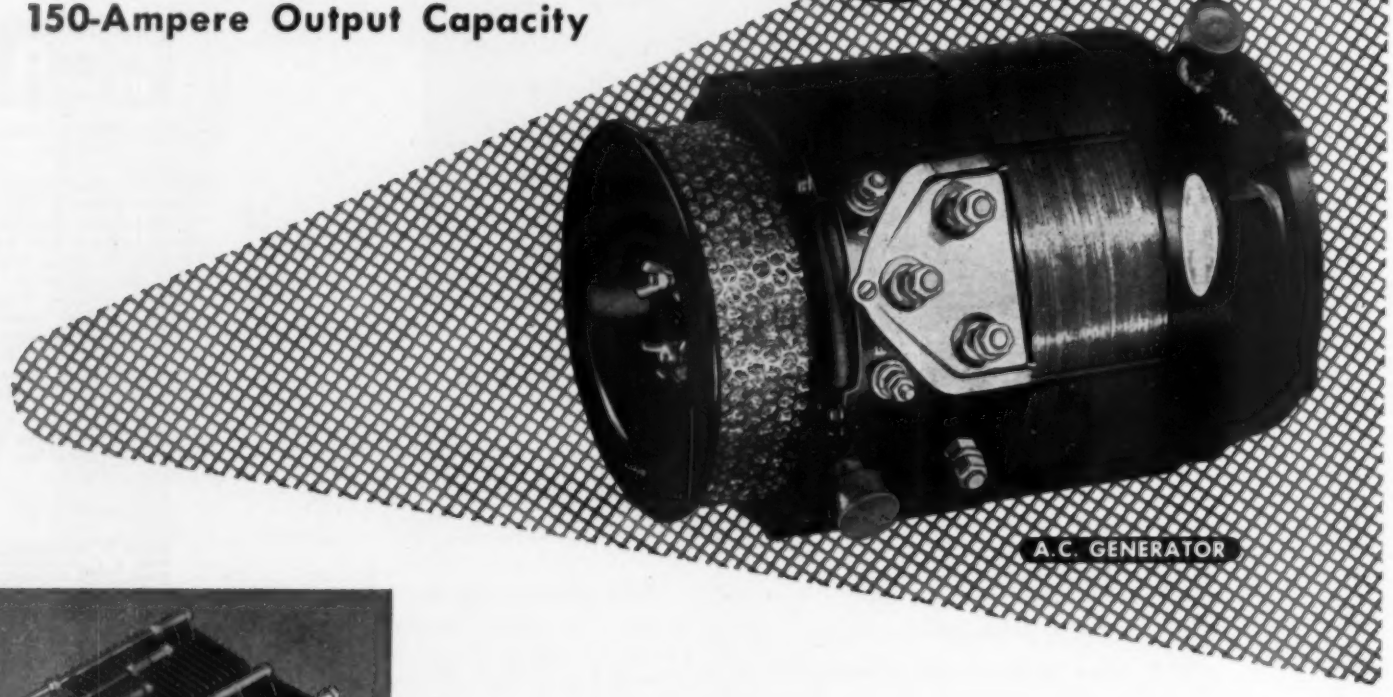

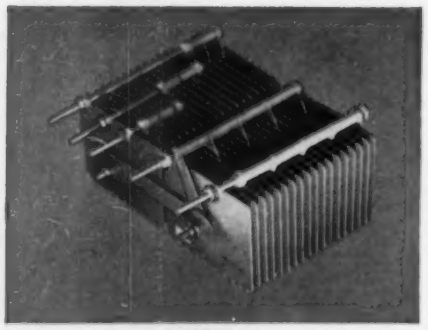

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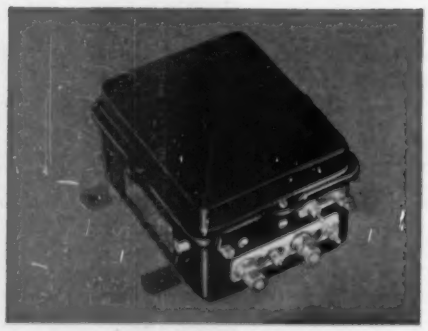

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The new Delco-Remy A.C. generator is the heart of a 12-volt A.C.-D.C. electrical system designed specifically for modern Diesel buses with fluorescent lighting and extra-heavy electrical loads.

It cuts in at approximately 550 generator rpm and reaches a maximum output of 150 amperes at approximately 1175 rpm.

The new generator not only supplies alternating current for fluorescent lighting, but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

Impressive features of the new generator are its relatively light weight, its very high output capacity and its ability to operate over a wide range of speeds.

Specify Delco-Remy electrical equipment on your new buses.

DELCO-REMY
Division, General Motors Corporation, Anderson, Indiana

WHEREVER WHEELS TURN OR PROPELLERS SPIN

NEODESHA, KANSAS

By LAFE PIPPIN*

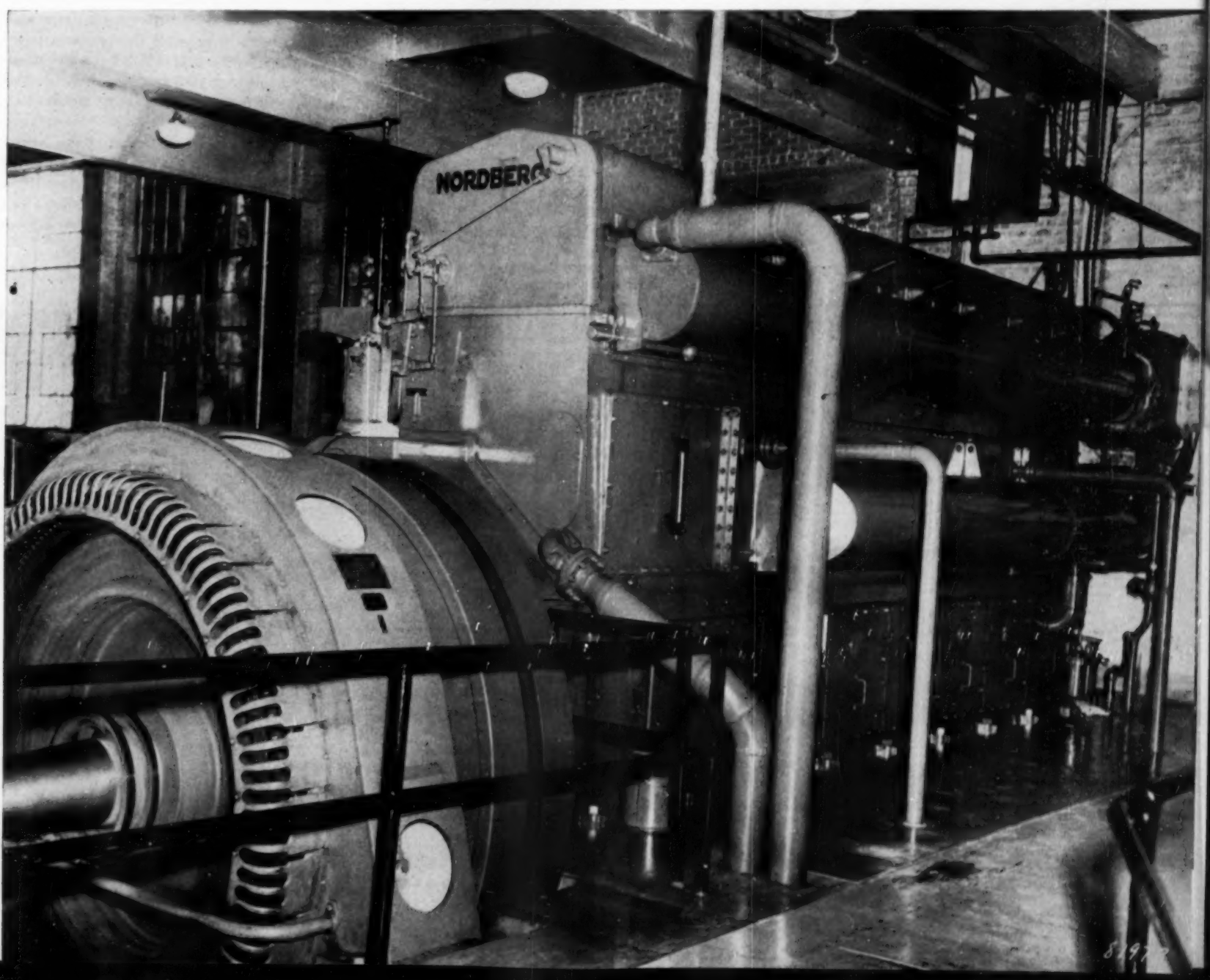
NEODESHA, Kansas has been supplying its citizens with electrical energy generated with Nordberg diesel and duafuel engines for over 30 years. Prior to 1922 the community used steam-driven generating equipment. That year Neodesha installed two 550 hp. Nordberg air-injection diesel engines driving 375-kw. generators and abandoned its steam plant. Diesel and duafuel engines have generated all energy supplied the community since.

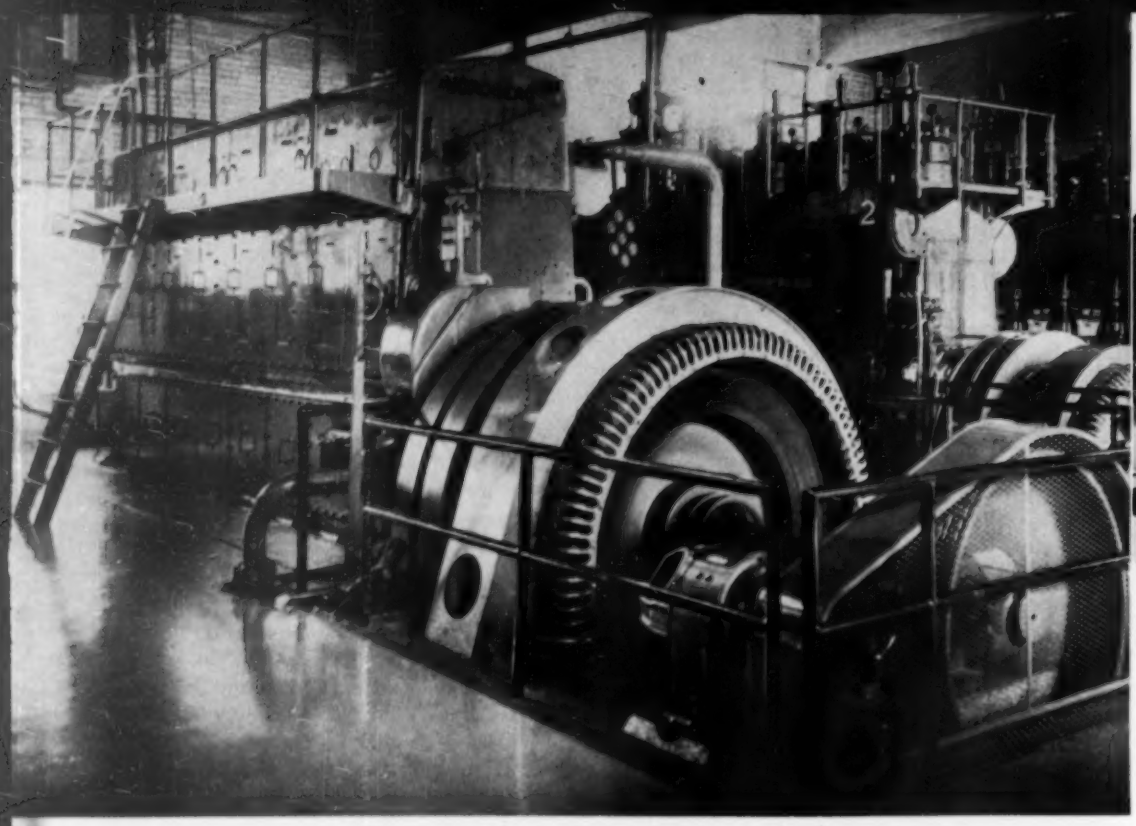
The original two-engine installation, totaling 1,100 bhp., served the city until 1934 when an 880 hp. Nordberg air-injection diesel engine driving a 600-kw. generator was added. Electrical requirements of Neodesha were handled by these three units until 1946. That year a 1620 hp. Nordberg air-injection diesel engine driving a 1,135-kw. generator was added. It was converted to Duafuel operation in 1948. The fifth and last engine, a 1750 hp. Nordberg, four-cycle, eight cylinder 16 in. x 22 in., 327 rpm., supercharged Duafuel unit, went into operation on January 30, 1952. It is provided with an intercooler between the air outlet of the turbo-charger and the engine to compensate for high ambient air conditions.

Up to 1948 the Neodesha plant, with air-injection engines, had burned residual fuel oil available from the local refinery. In 1945 fuel oil was costing 3c per gallon. When the average price went to 7.85¢ in 1947, with gas available at 15c per mcf., the decision was made to convert a unit over to dual-fuel operation. The 1620-bhp. engine was converted to burn gas in 1948. The effect of this change to gas on the fuel cost per kwh. generated is interesting. In 1946 the plant burned 504,646 gallons of oil to generate 5,240,800 kwh. at a fuel cost of 3.34 mills per kwh. In 1947 the fuel cost using oil had increased to 6.85 mills per kwhr. During 1952 a total of 11,650,600 kwhr. were generated using 156,263 gallons of oil and 117,865,000 cu. ft. of natural gas at an average fuel cost of 2.53 mills per kwh.

*Superintendent, Municipal Power Plant, Neodesha, Kansas

Exhaust side of the 1750 hp. Nordberg four-cycle supercharged Duafuel diesel, newest engine in the Neodesha plant.





Lafe Pippin, Superintendent of the Neodesha, Kansas Municipal Power Plant, author of this article.

Another view of the new 1750 hp. Nordberg. To the right is the 880 hp. 600 kw. 2-cycle Nordberg installed in 1934.

Plant production costs for the years 1927, 1932, 1942, and 1952 are set forth in Table 2. The low production cost of 4.7 mills per kwhr. attained in 1952 is due to a combination of low-cost gas and high load factor realized by supplying the local Standard Oil Company refinery while additions were being made to the refinery power plant. Today all five Nordberg engines that have been installed in the station since 1922 are used in regular operation. As would be expected, the two larger units log more hours operating time than do the three smaller ones, but all are used for power production. For example, during 1952 the hours operation of the five units were as follows:

Unit No.	Installed	Bhp.	Operating Hours
1	1946	1620	7580
2	1934	880	2202.5
3	1922	550	350.5
4	1922	550	288
5	1952	1750	7014

Operating hours for all five units between January 1, 1927 and January 1, 1953 are given in Table 1.

In 1923, the second year diesel engines served as prime movers in the plant, the total generation was 1,400,000 kwh. During 1952 this plant with an installed capacity of 5,350 hp. generated 11,650,600 kwh. The plant operators will hasten to tell you that the 1952 production was something unusual because the local Standard Oil Company refinery was supplied with electricity during the year while additions were being made in the steam power plant at the refinery. In 1951, for example, the plant generated 5,354,900 kwh., and the production in 1953 will probably not exceed 6,000,000 kwh.

The per capita energy production of this municipal plant during the years it has employed diesels for prime movers again illustrates the tendency for continually increasing use of electricity. Back in 1923, for example, the plant produced about

TABLE 1

SUMMARY OF ENGINE DATA

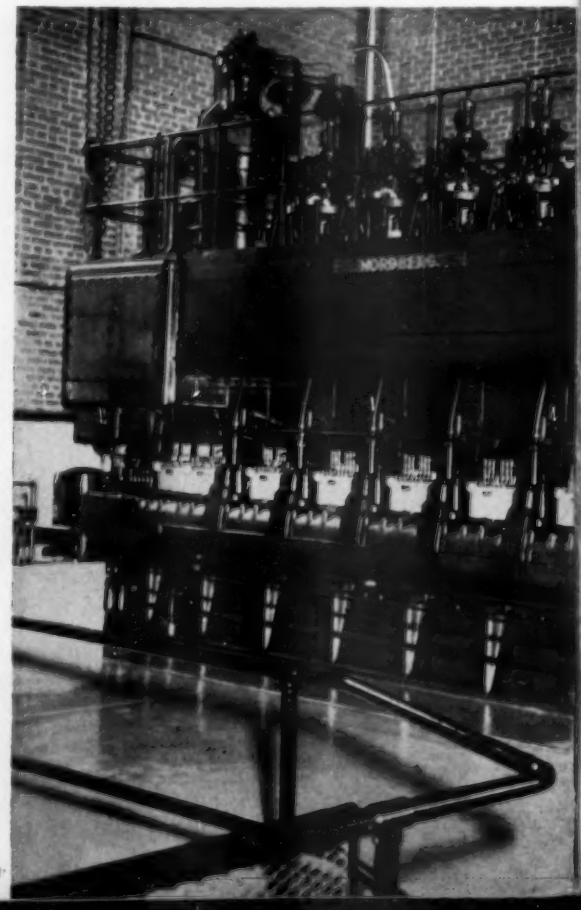
Unit No.	1	2	3	4	5
Date Installed	1946	1934	1922	1922	1952
Bhp	1620	880	550	550	1750
Bore & Stroke	18x25	17x23	15x20	15x20	16x22
Speed, rpm	277	257	225	225	327
Stroke Cycle	2	2	2	2	4
Fuel Injection	air	air	air	air	Mech.
Hours Operated* (To Jan. 1, 1953)	57,349.5	109,694.5	86,869.2*	92,867.1*	7,014

*Data on operating hours for Units 3 and 4 for the years 1922 to 1926 inclusive is not available.

TABLE 2

PLANT OPERATING COSTS

Year	1927	1932	1942	1952
Fuel	$ 6,930.24	$ 4,724.38	$10,822.07	$29,424.36
Lube Oil	837.65	890.56	804.67	2,382.05
Labor	7,224.50	6,831.00	9,564.70	15,225.00
Engine Maintenance	4,715.87	314.12	1,168.92	1,586.05
Misc. Costs	99.62	249.01	1,194.64	6,333.14
Total Operating Cost	$19,807.88	$13,009.07	$23,555.00	$54,950.60
Gross Gen, kwhr	2,065,800	1,758,100	3,526,900	11,650,600
Total Opr. Cost — Mills/kwhr	9.6	7.4	6.7	4.7

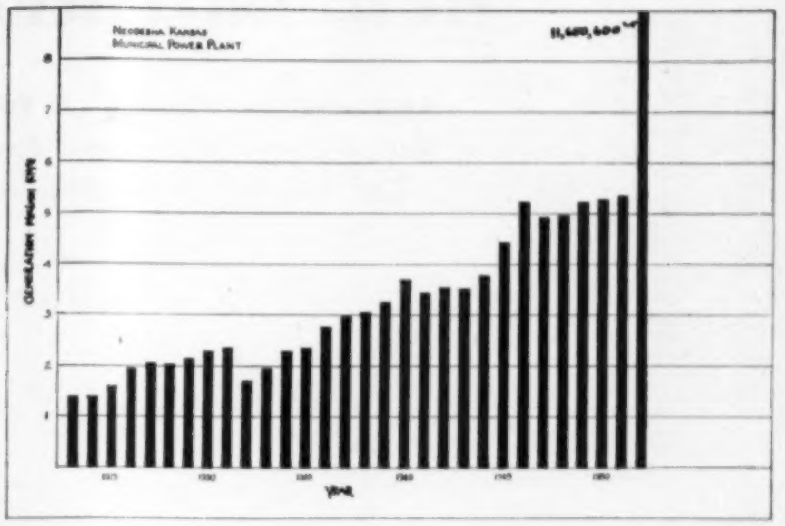


355 kwh. per capita. By 1930 this figure had increased to 660 kwh. per capita, and in 1940 it was up to 1,100 kwh. per capita. In 1950 the production was 1,420 kwh. per capita. In spite of the fact that the population of the community has remained relatively stationary for the past 30 years, the demands for electricity continue to increase. The bulk of the energy generated is sold to residential and small commercial consumers. The power requirements for an alfalfa meal plant adjoining the power plant are very nominal, as are the power demands of the Independent Plow Company, the Missouri Pacific and Frisco railroads, and other small industrial users.

Following are some of the important features of this latest engine installation in the Neodesha plant. The engine is equipped with a gear-driven lubricating-oil pump as well as a motor-driven Blackmer auxiliary lubricating oil pump. Both a duplex strainer and full-flow filters are used in the lubricating oil circuit. Cooling of the lubricant is done by a shell-and-tube heat exchanger, with thermostatically-controlled bypass valve to maintain constant lubricating-oil temperature. Jacket-water cooling is accomplished by means of a shell-and-tube heat exchanger. A single jacket-water pump supplies the engine. Constant jacket-water temperature is maintained by means of a thermostatically-controlled bypass valve. Intake air passes through a

Cycoil air filter and a Burgess-Manning silencer. Exhaust is through a Burgess-Manning exhaust snubber. All generators and exciters in the plant are General Electric. In 1949 an addition was made to the power plant building for housing modern metal-clad switchgear. This gear, of General Electric design, controls five generators, five outgoing feeder circuits, station power and street lighting circuits.

Kilowatt hour production chart of the Neodesha, Kansas Municipal Power Plant.



List of Equipment

Generator and Exciter—General Electric

Air-intake Filter—American Air Filter Cycoil

Air-intake Silencer—Burgess Manning

Exhaust Silencer—Burgess Manning

Shell-and-tube Heat Exchangers—Kewanee-Ross.

Lube-oil Strainer—Elliott Co., twin type

Auxiliary Lube-oil Pump—Blackmer

Lube-oil Filter—Hilco Type FA 4 Hyflow

Jacket-water Pump—Allis Chalmers Mfg. Co.

Thermostat-controlled Bypass Valves—Powers Type K342 Flowrite

Fuel-oil Filters—Nugent duplex

Supercharger—Elliott Model L-604, size 1L3

Force Feed Lubrication—Manzel

TABLE 3
Analysis of Fuel Oil Now Being Used

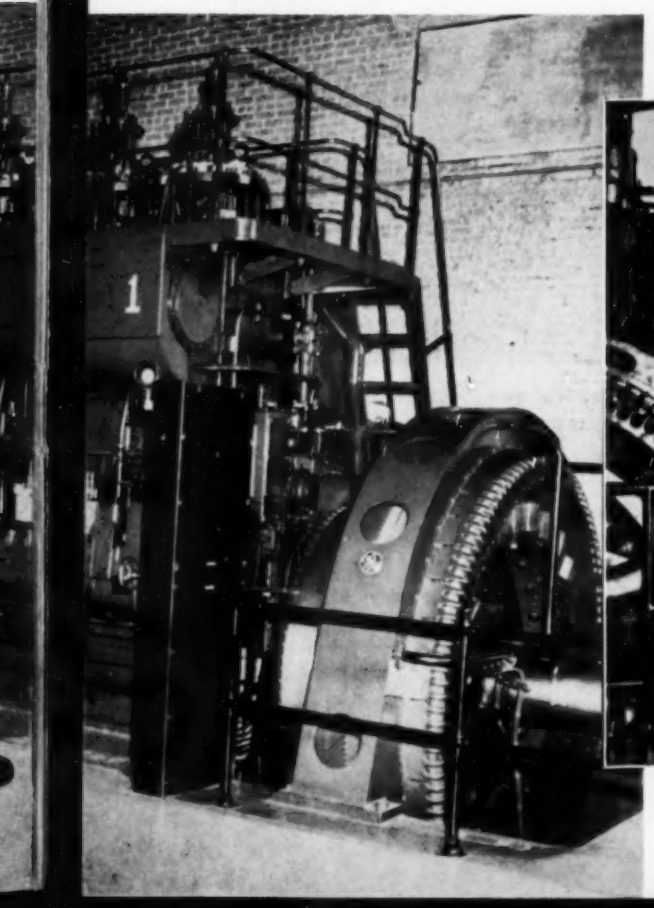
API Gravity	20-28
Flash	165 F min.
Sulfur	1.5% max.
Water and sediment	1.0% max.
Viscosity at 100F	55 SSU
Conradson carbon	0.5% max.
Heating value	142,000 But/gal

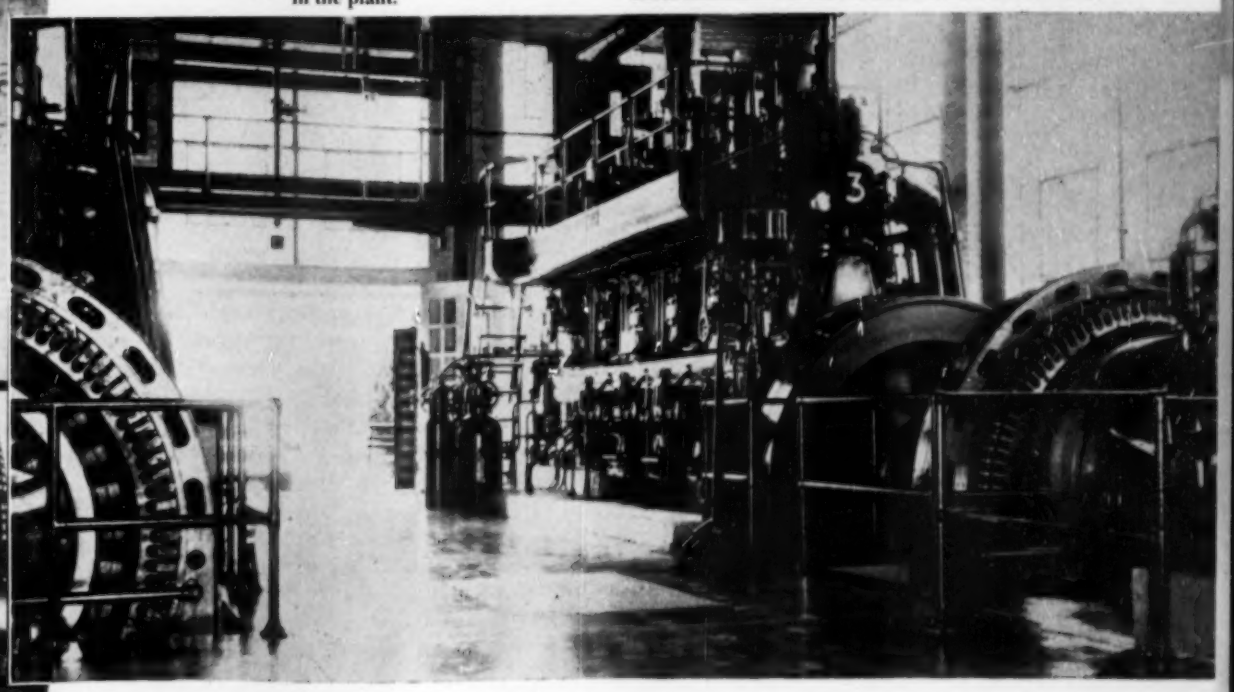
TABLE 4
Plant Fuel Costs

Year	Fuel Oil ¢/gal.	Gas ¢/mcf.
1943	3.0	
1944	3.03	
1945	3.0	
1946	4.1	
1947	7.85	
1948	8.0	15.0
1949	6.5	15.0
1950	6.87	15.0
1951	7.35	15.0
1952	7.16	15.47*

* Price of gas increased from 15 to 17c in October, 1952.

***Left*, operating side view of the 1680 hp. Nordberg diesel installed in the Neodesha plant in 1946. Note Manzel lubricators. It was converted to Dual-fuel in 1948. *Below*, over 30 years old and still going strong is this 550 hp. Nordberg. It is one of two similar units in the plant.**





RUBBER-TIRED RAILROAD

LeTourneau Unveils A Diesel Engined, Rubber-Tired Locomotive and Freight Car Combination For Use in Undeveloped Areas of The World

By DOUGLAS SHEARING

TESTING and developing has been going on for several years at Longview, Texas—and now R. G. LeTourneau, equipment inventor, has unveiled the Tournatrain—a rubber tired locomotive and freight car combination capable of economic operation over pathless desert sands or a cheaply constructed road through the Amazon or African jungle. Mr. LeTourneau stated that the heart of the Tournatrain is his "electric wheel," which carries a large pneumatic tire and has within its rim an electric motor and gear reduction. These electric wheels are being built in different sizes to take tires from 5 to 10 feet in diameter.

Every wheel of the Tournatrain is a rubber tired, self propelled electric wheel. The electric wheels derive their energy from the locomotive which mounts diesel engine driven electric generators. The make and model of the diesel engine depends on the desire of the user. The Tournatrain engineer, from his cab on the locomotive, applies power at will to all wheels of the Tourantrain. In this way each freight car provides propulsion for its own load—each car of the Tournatrain pushes and pulls at the same time. There are no brake shoes to wear out because the same electricity that drives the wheel can be used to hold it back going down hill. Only an automatic spring loaded brake is provided for emergency.

Each car is coupled to the car ahead of it in such a way that it follows in the same tracks. By a simple automatic steering device the path of the locomotive is duplicated in its turn by each car of the train so that the locomotive can pull up to a street intersection and make a right angle turn and every car will come up to the same spot and make the same turn. With this combination—electric self propulsion in every wheel—large diameter and wide base tires providing flotation over sand and bog—each

car tracking the one in front of it—all these make it economical for today's transportation planners to pay as they go. While the Tournatrain will run faster on a good road than on a bad one, it will operate on a mere bulldozer trail at slow speed to get products to the market—later, according to "what the traffic will bear," the road can be improved and the same train will operate faster and at lowered costs.

It will not supplant the railroad as we know it today in industrial areas. Standard railroads, with their right of ways and rails already paid for, will continue to be a low cost medium of transportation in highly developed and industrialized countries. The Tournatrain, on the other hand, may well be-

Looking forward between freight cars of Tournatrain. Note electric motor associated with each wheel. Center motor provides auxiliary steer when required.

Tournatrains being built consist of eight 20-ton capacity freight cars. Men and auto contrast size of locomotive.

The freight cars of self propelled diesel-electric Tournatrain track in path of locomotive.

come the trail blazer for cargo transportation in undeveloped areas. If it were allowed on city streets, it could drop you a carload of coal or cement right at your door. The wear on pavement would be less than ordinary trucks because the tires carry lower pressures; therefore the pressure per square foot of pavement is much less. This is one of the secrets of the Tournatrain's ability to travel over soft ground or desert sands.

The locomotive does not pull the cars as an ordinary diesel electric railroad train. Every car pulls itself. The locomotive just supplies electricity and leads the way. The ordinary train requires that the grades be nearly level on account of the traction, while the Tournatrain can climb a steeper grade than an automobile, so that tunneling a mountain or zigzagging up its sides will not be necessary.

This modern engineering feat suggests a trackless train carrying passengers and cargo north and south across the vast North African deserts. Or perhaps you can visualize mile upon mile of African shoreline without transportation to the interior awaiting Tournatrain development, at first over a bulldozer trail, and then as towns develop over prepared high speed road beds.

Five Kenworth and five International Harvester tractors with semi- and full-trailer; these ten trucks are powered with Cummins model NHRBS-600 300 hp. diesels. Oahu Transport truck parking area is in the background.

Standing in front of Oahu Transport Co. office from left to right: John C. Walker, President and General Manager; Fred F. Hedeman, Vice President in charge of operations; Keinerd M. Watson, maintenance superintendent.

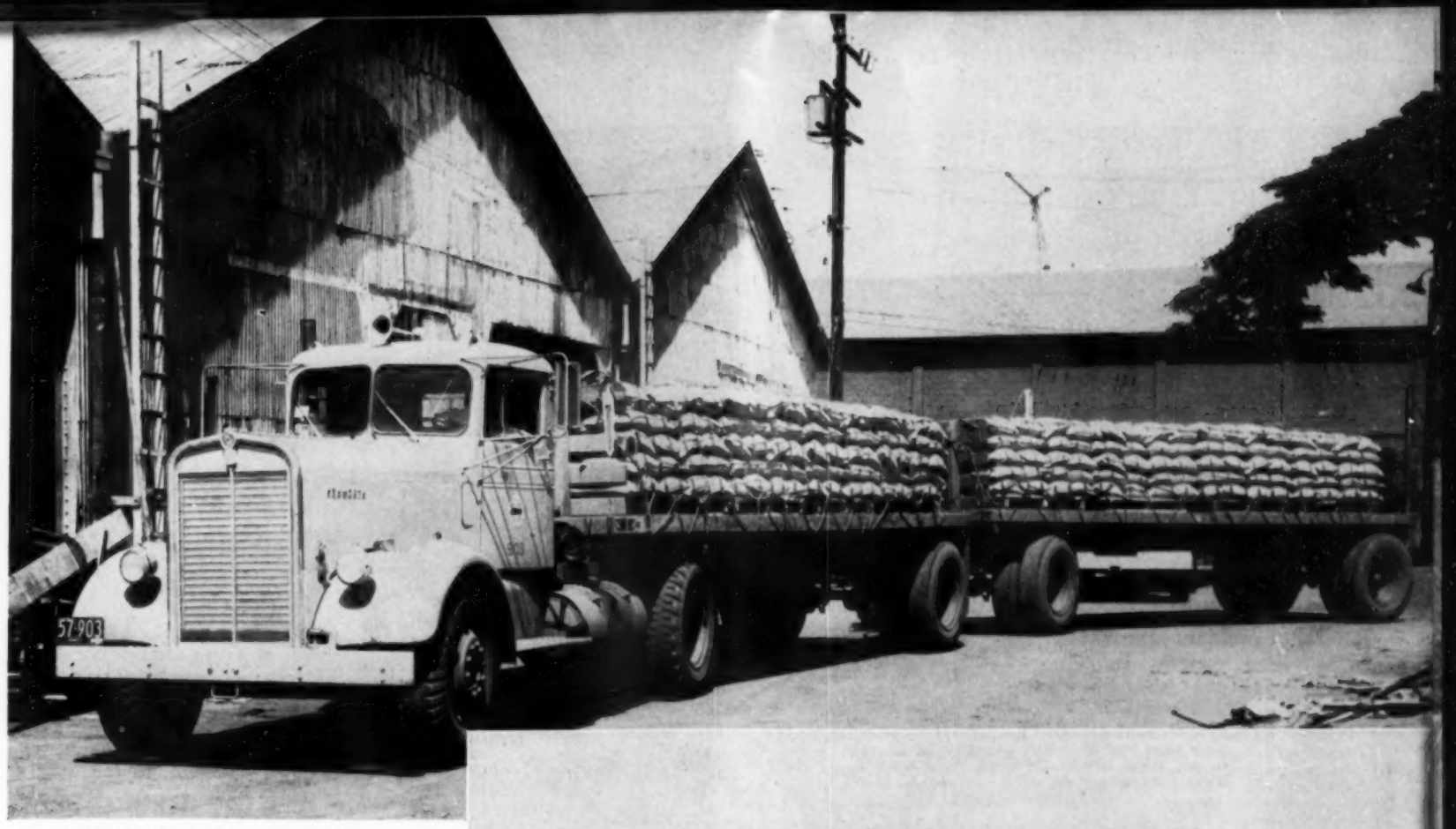
DIESEL TRUCKING IN HAWAII

By BRUCE WADMAN

ON the last day of 1947, an antiquated train puffed elegantly in from her last ride, and that was the end-of-the-line for the old Oahu Railway in Honolulu. The railroad was a part of Oahu's history, and its romance for 58 years. (Oahu is the capital island of the Hawaiian chain, the island on which Honolulu is situated.) Its tracks skirted much of the rugged shoreline, providing the means for carrying Oahu's sugar and pineapples to market. Besides, the Oahu Railway offered day-coach service on one of the most picturesque runs in American railroading. Honolulans used to go just for the ride. While the rail operation is now confined to terminal switching at the Honolulu harbor piers, the Oahu Railway and Land Company has for many years had diversified interests in bus operations, land, wharves and storage warehouses and has recently merged with Young Bros., Ltd., operators of sea-going tugs and barges.

Modern highways have superseded the railroad, and today, Oahu's plantations send their products to Honolulu in trucks of the Oahu Transport Co., Ltd., which started operating Jan. 1, 1948, the day after the Oahu Railway's last ride. Oahu Transport serves the essential functions of the old railroad and many more besides. Sixteen diesel trucks are major items among the company's more than 200 pieces of equipment. The trucks include: eight model CD-521 Kenworths and five model LD-405 International Harvesters powered by Cummins 300 hp. supercharged model NHRBS-600 diesels; two model CC-521 Kenworths and one Autocar powered with Cummins 200 hp. model NHB-600 diesels. These are all tractor trucks with semi- and full-trailer trains. All the trucks have a Gross Combination Weight of 80,000 pounds each and carry a payload of 24 tons. Sixteen additional tractors powered by Cummins NHRBS-600 diesels are on order. They serve four island sugar mills—Ewa, Waipahu, Waialua, and Kahuku—and the pineapple plantation of the California Packing Corp. Besides hauling pineapples to the cannery and raw sugar to the Honolulu docks for shipment to California for refining, the diesel trucks carry fertilizer, lime, bags, maintenance material, machinery and other needed items to the mills and plantations.

Oahu Transport Co. has grown rapidly in a brief five years. It now hauls over 200,000 tons annually of bagged sugar, raw and refined, and an additional 45,000 tons of bulk raw sugar from Waipahu plantation to the C. & H. refinery at Aiea. Total yearly quantity of fresh and processed pineapple exceeds 300,000 tons, as the company handles processed fruit for both California Packing Cor-



Kenworth tractor with semi- and full-trailer loaded with bagged raw sugar at Pier 19, to be unloaded and shipped by freighter to California.

Oahu Transport Co. Uses Diesel Trucks To Haul Sugar and Pineapples, Replacing Outmoded Rail Operation

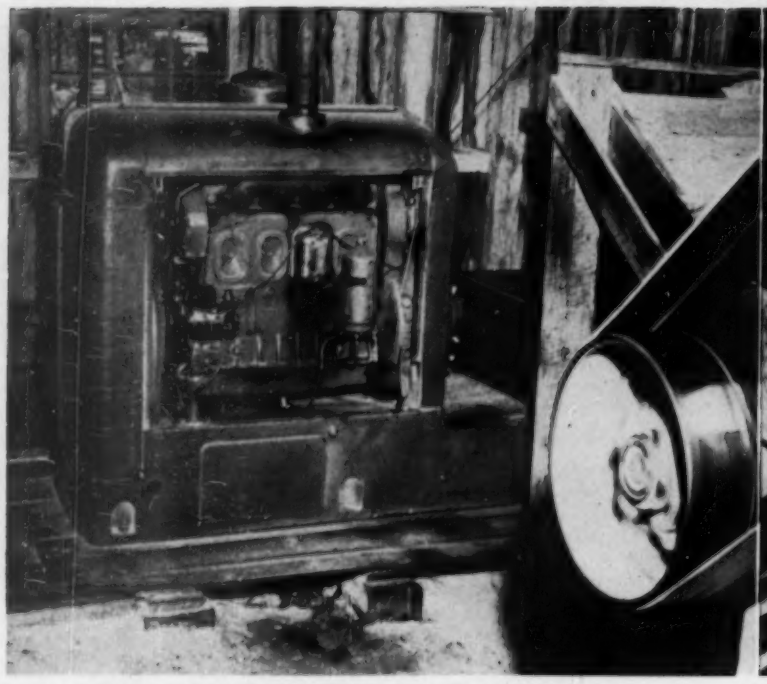
poration and Libby, McNeill and Libby. Total haulage of all commodities transported by the company exceeds 500,000 tons a year.

The cornerstone of Oahu Transport's efficiency and responsibility has been its training program. Before the start of operations at the beginning of 1948, the Company engaged twenty-six men who had had experience in trucking operations with the Oahu Railway. These men were given an intensive training course in truck handling, mechanics, maintenance, traffic regulation, and load handling. On Jan. 1, 1948, 156 additional employees were engaged, and since that time, all operating personnel has been put through the training course. This intensive training of all the truck drivers, which is a continuing program to insure maximum efficiency in the operation of the trucks, coupled with the inherent dependability and efficiency of the diesel equipment, are two things that have contributed largely to a highly successful operation. The Company started its operations at its present location, 290 Sand Island Access Road, Honolulu, where a truck parking area, a warehouse, temporary shops, a filling station and recreation building had been constructed during the latter part of 1947. Since that time, the facilities have been increased, the most recent unit being a new office building. Facilities now include:

Kenworth tractor and semi-trailer powered by a Cummins NHRBS-600 300 hp., supercharged diesel bringing in a load of pineapples to the cannery in Honolulu.

Land Area—15¼ acres
Freight receiving warehouse—10,890 sq. ft. of floor space
Storage warehouse—36,300 sq. ft. of floor space
Storage warehouse at Pier 19—64,440 sq. ft. of floor space
Repair Shop—including machine shop, electrical shop, engine shop, tire shop, and parts storage
Filling station—with three 5,000 gallon storage tanks
Lubrication building
Recreation and locker room building
Office building

In 1889, when Benjamin F. Dillingham braved public ridicule and started his Oahu Railway, much of the island outside of Honolulu was wilderness. The railway is now memorialized as one of the greatest single factors in the growth of island agriculture. The main line operation was finally discontinued because modern diesel trucks could transport sugar and pineapple better, faster, and more economically. This is another chapter in the story of the old giving way to the new. The chapter can be included in the story that those in the Diesel Engine Industry know so well—diesel progress.



This 4-cylinder GM diesel has powered Hackett's excelsior plant since 1946 when only two pieces of equipment were in use. Today it furnishes power for a cut-off saw, a debarker, shredding and padding machines and a baler.

This machine accommodates four blocks of wood at a time. Two serrated knives moving back and forth at high speed shred the wood into excelsior. A conveyor carries the material to the baling machine.

TURNING TIMBER INTO PACKING

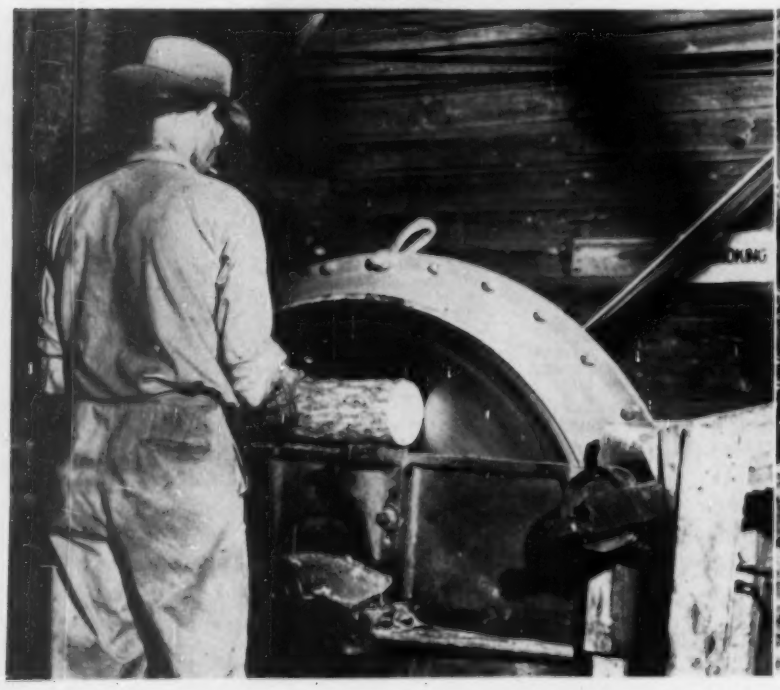
TURNING timber into the soft pliable packing material known as excelsior requires special "know-how" in a unique manufacturing process as well as complete knowledge of lumbering and sawmill operation. Mr. J. R. Hackett has been in the excelsior business near Randleman, North Carolina only since 1946 but today he has one of the most modern and complete plants in the industry. This has been brought about by constant improvement in his plant lay-out, much experimentation and numerous changes in his equipment to attain maximum efficiency.

Hackett's mill now has a capacity of 120 sixty-pound bales per day. A major part of his business, however, is the production of paper-covered pads used by furniture manufacturers. The material he turns out saves shippers thousands of dollars per year in reduced breakage and protection of fragile articles in transit. The process starts in the woods where Hackett cuts his own timber. At the mill the logs are reduced to 18 inch lengths and debarked.

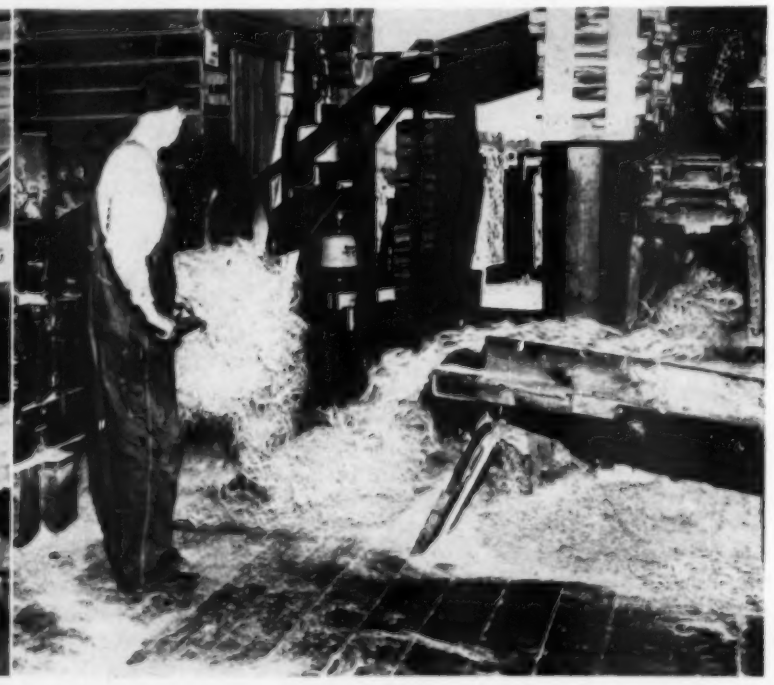
After aging for 60 days they are run through a shredder. Four blocks at a time are locked into this machine with two serrated knives. These move back and forth at high speed and with a shredding action transform the wood into excelsior. A conveyor belt beneath the machine carries the material to the balers.

The plant is powered by a 4-cylinder General Motors diesel engine and this, Mr. Hackett says, is about the only piece of equipment that has remained unchanged since the business started. It drives all plant equipment through a series of shafts, belts and pulleys.

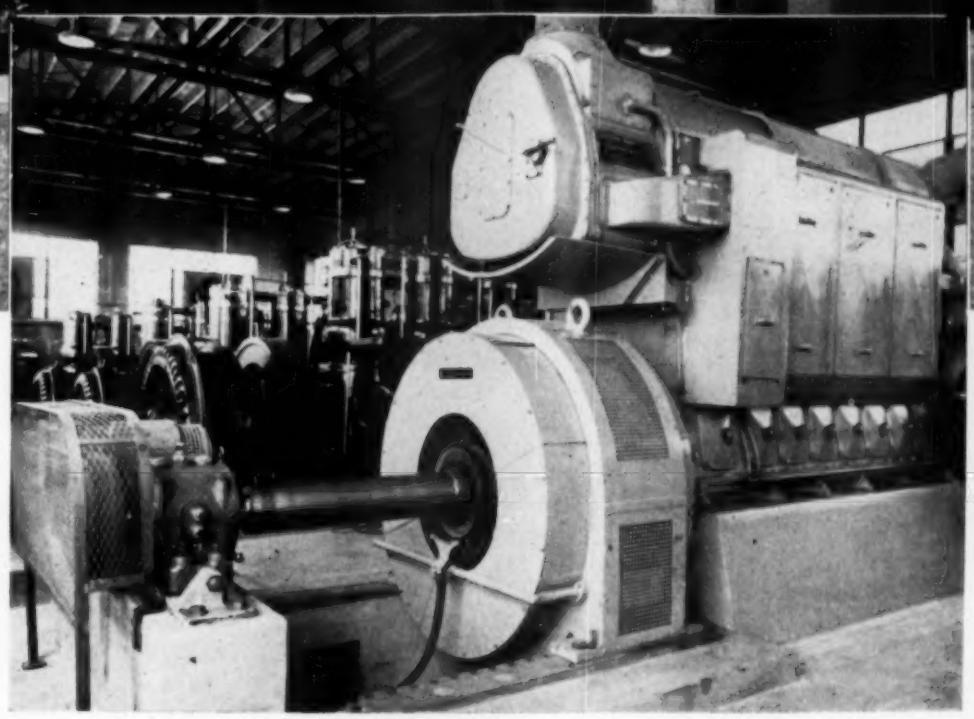
An abrasive wheel moving at high speed quickly removes bark from the blocks of wood preparatory to the shredding operation.



As the excelsior streams from the shredder, it is fed to another machine which packs it tightly into 60 pound bales.



The Teague municipal power plant, which has cut fuel cost per kilowatt-hour to less than 4 mills with a new Fairbanks-Morse dual fuel engine.



Most powerful engine in the Teague plant is this 960-hp., 6-cylinder, Model 38D8¼ Fairbanks-Morse opposed-piston dual fuel engine which drives a 675 kw. F-M generator.

TEAGUE, TEXAS

By R. D. SLONNEGER*

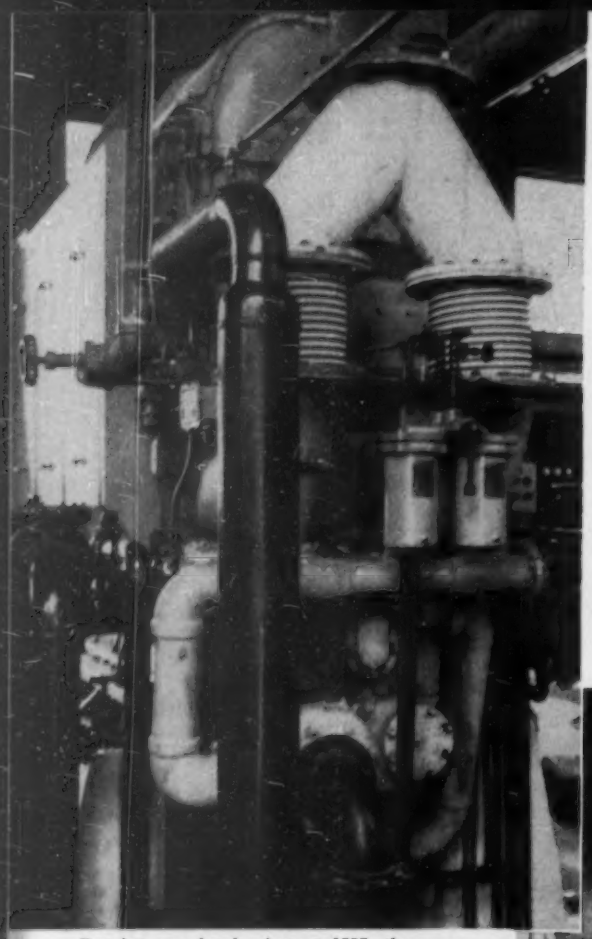
THE progressive central Texas City of Teague is producing power for less than four mills per kilowatt hour after modernizing the city-owned power plant with a 960 horsepower Fairbanks-Morse, opposed-piston, dual-fuel engine. This low operating cost is especially important considering the ever increasing load on the Teague plant. The continuous increase in demand is shown in Table I. During this same period the water pumped by the municipal water works increased from 58 million to 81 million gallons per year while water reserves have been built up to 700 million gallons. With less than a 100 percent increase in the water consumption, the 300 percent increase in electrical demand is due largely to the increased per capita use of electricity by the citizens of the community. This consumption has been encouraged by low rate schedules.

On November 18, 1929, the city of Teague placed three 180 horsepower Fairbanks-Morse diesel engines into operation to inaugurate the municipally owned power service. The increase in power demand illustrated above brought about a corresponding growth in the power generation facilities required. In 1939 a 375 horsepower Fairbanks-Morse diesel was added. After 13 years of service, one of the original 180 horsepower engines was removed to make way for a 450 horsepower Fairbanks-Morse engine. This was followed in 1947 by the addition of the last straight diesel engine, a F-M 575 horsepower unit. Increased fuel costs added to the fact that the existing plant was rapidly getting full of small engines caused the greatest change in the plant operation. August 1952 marked the putting into service of a 960 horsepower, Model 38 DD8⅛, 8⅛ x 10 in., 6 cylinder, Fairbanks-Morse, opposed-piston, dual-fuel engine. At this same period the physical plant was extensively remodeled and a new electrical switchboard was installed.

An interesting sidelight in the story of this plant is a piece of auxiliary equipment placed in service on November 18, 1929. A Fairbanks-Morse centrifugal water pump was installed in the raw water circuit, and at the time of installation some good natured by-play caused a manufacturer's representative to promise free replacement of the pump in 20 years providing the seal was not broken. Record was made of the promise, and in 1949 Fairbanks-Morse offered to replace the pump, but the plant superintendent, Mr. B. H. Tyus, did not choose to part with an old faithful servant. Today, after practically continuous operation for 24 years, the pump (with unbroken seal) is still serving as a raw water pump.

Reliable service, free from maintenance troubles is important for both prime movers and accessory equipment, but low operating cost is equally important to Mr. J. E. Lambert, Manager of Utilities for the City of Teague as well as for the taxpayers and power customers. Striking changes were wrought in this field when the switch was made from diesel to dual-fuel operation. Table 2 is illustrative of the period from June, 1952, through

*Assistant Professor of Mechanical Engineering, University of Texas.



Put into service in August 1952, the Fairbanks-Morse dual fuel engine has carried the bulk of the load and cut plant fuel costs in half. This view shows the exhaust header, Nugent fuel filter, Woodward governor and Chicago Flexible Hose on the exhaust header.

At center are the Maxim exhaust silencer and the American Cycoil air filter which served the opposed-piston engine.

TABLE I

Year	Total KWH
1930	932,100
1935	1,019,100
1940	1,224,400
1945	1,809,500
1950	2,576,400
1952	3,049,900

May, 1953, clearly demonstrating the savings realized with the introduction of an efficient dual-fuel engine utilizing natural gas as the principal fuel. The cost of power generation during June and July, 1952, was about 8 mills per kilowatt hour—fuel cost for operation with straight diesel engines. August 5, 1952 marked the beginning of service with the Fairbanks-Morse opposed-piston, dual-fuel engine, resulting in the sudden reduction in fuel costs to 3.6 mills per kilowatt hour. The plant load is such that the new engine can be operated practically all of the time without assistance from other equipment, but it must be emphasized that the figures in the table are for the entire plant, not just for the new engine. Since installation, the heavy-duty engine has been on the line nearly 95 percent of the time.

A study has been made of the lubricating oil costs for the plant before and after the installation of the new unit. Figuring on the basis of 50 and 60 cents per gallon, June and July, 1952, showed 0.72 and 0.75 mills per kilowatt hour for lube oil costs. This was prior to operation of the O-P engine. August through November, break-in period for the new engine, averaged about 0.60 mills per kw.hr. The final settling of the piston rings reduced the cost to 0.37 and 0.36 mills per kw. hr. in December 1952, and January 1953, respectively. Expressing the figures for the last two months in a different manner: December shows 4578 horsepower hours per gallon of oil and January gave 4994 horsepower hours per gallon. During the period covered since the installation of the O-P engine, it was the only engine on the line most of the time so the figures are for all practical purposes for that engine alone. Inspection of the cylinders was made at frequent intervals by looking through the ports. These checks, bi-weekly at first, reveal no ring sticking, and an extremely small amount of carbon deposits, indicating almost perfect combustion with attendant long life for piston rings and cylinder liners. Starting the engine is accomplished with compressed air from 6 tanks containing air at 250 psig. Two motor driven and one gasoline engine driven compressors provide the compressed air. The diesel fuel used as pilot oil is of a fairly high grade, zero distillant type, in order to minimize storage problems at low temperatures. When the plant operated on diesel fuel alone, it was a policy to use a higher grade fuel in the winter, and a cheaper fuel in the summer when storage problems were not so great. Two above-ground tanks with a capacity of 10,000 gallons supply a 625 gallon day tank by gravity flow. Metering is accomplished between the storage tanks and the day tank. Fuel oil is delivered from the day tank by engine-driven, gear-type, fuel pump, through a two cartridge filter, to the injection pump header; the overflow returning to the day tank.

A "Cycoil" type oil-bath, intake air filter and silencer is used on the suction of the gear driven, Roots-type, blower for scavenging air. Air is discharged from the blower at about 2½ psig. passing through the manually operated control valve before reaching the supply manifold to the cylinders. Ex-

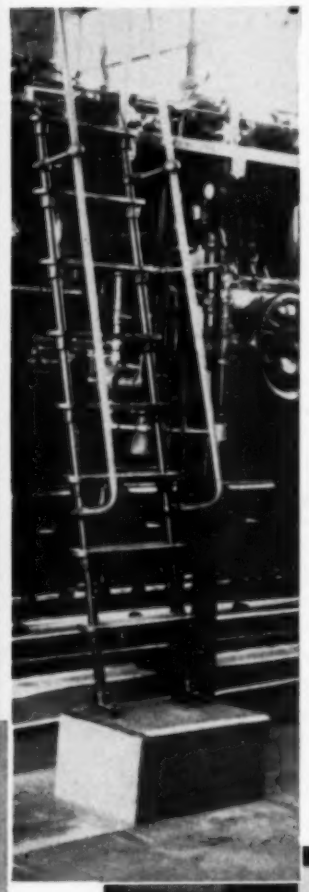
TABLE II

CITY OF TEAGUE, LIGHT PLANT FROM JUNE 1952 TO MAY 1953

Month	Total Kwh.	Lube Oil Gallons	Fuel Oil Gallons	Gas M Cu. Ft.	Fuel Cost Dollars	Fuel Cost Mills/kwh
June	275,300	402	24,640	.....	$2,233.80	8.1
July	312,100	473	26,820	.....	2,449.15	7.8
Aug.	348,500	346	4,782	3,998	1,280.77	3.6
Sept.	285,600	272	3,558	3,506	1,052.75	3.6
Oct.	237,500	263	6,525	2,507	1,122.40	4.7
Nov.	227,900	245	5,970	2,389	1,045.65	4.5
Dec.	249,600	156	3,525	3,253	937.42	3.7
Jan.	240,200	143	3,520	3,213	931.21	3.8
Feb.	214,400	134	3,065	2,969	833.51	3.9
Mar.	241,200	130	3,360	3,331	918.87	3.8**
Apr.	200,600	150	4,910	3,011	902.70	4.5
May	246,000	135	3,455	3,443	959.40	3.9

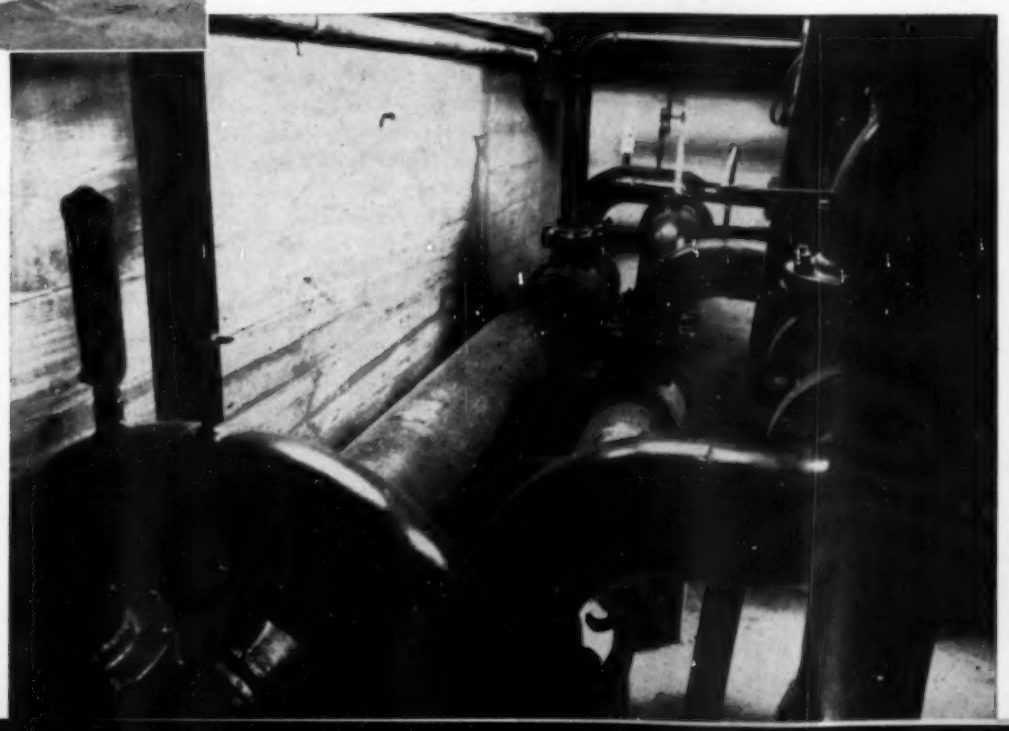
** New Fairbanks-Morse engine only unit in service for this entire month.

haust products pass from the plant through a silencer, which, incidentally, is still very clean after nearly one year of service. A heavy-duty, detergent type oil has been selected as the lubricating oil for service with this engine. The wet sump has a capacity of 240 gallons of lubricating oil, and at present the operators add just about 4½ gallons each day. A cartridge type filter of the by-pass type is operated in the system in conjunction with a strainer. The engine-driven pump and the before-operation pump are both gear type pumps, the latter being driven by an electric motor. The before-operation pump is used only to bring the lube oil pressure up before starting, as the O-P engine does not require after-operation service. A change of oil filter elements was made after 6000 hours of operation, and it is planned to change elements at least once each year depending on the condition of the oil. This long filter life is another indication of the clean operation of the dual-fuel OP.

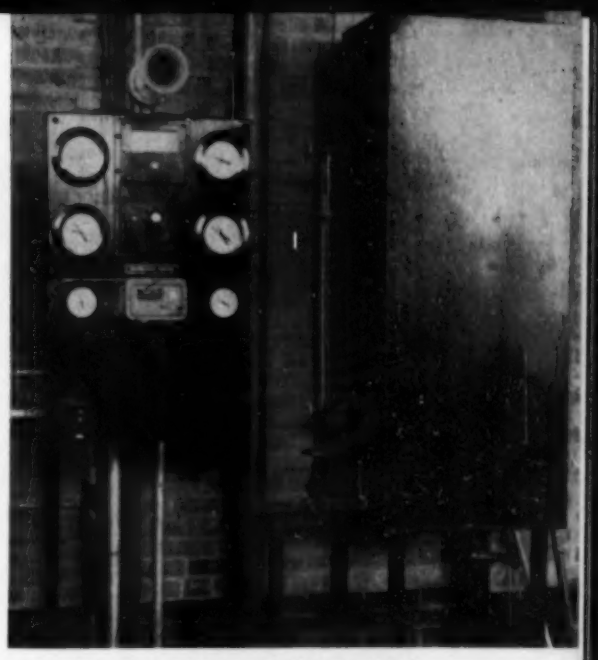


The Teague plant houses six Fairbanks-Morse engines ranging in size from 180 hp. to 960 hp. The new opposed-piston dual fuel unit is second from the right.

The cooling of the engine jacket water and the oil is accomplished with a closed cooling system. The raw water, which is of a high purity, is circulated through the oil cooler and then through the jacket water exchanger by the aforementioned F-M centrifugal pump. Shell and tube heat exchangers are used in both cases, while the cooling tower is of redwood construction. Engine jacket water leaves the engine at 150 degrees F. This temperature is thermostatically controlled. Ordinarily the temperature rise in the jacket through the engine is 5 to 10 degrees. The engine operates at 720 rpm. and is direct-connected to a 675 kw. Fairbanks-Morse generator with a belt-driven exciter. An engine control and alarm panel is located near the blower end of the engine.



Jacket water and lubricating oil for the opposed-piston engine are cooled in these Ross heat exchangers.



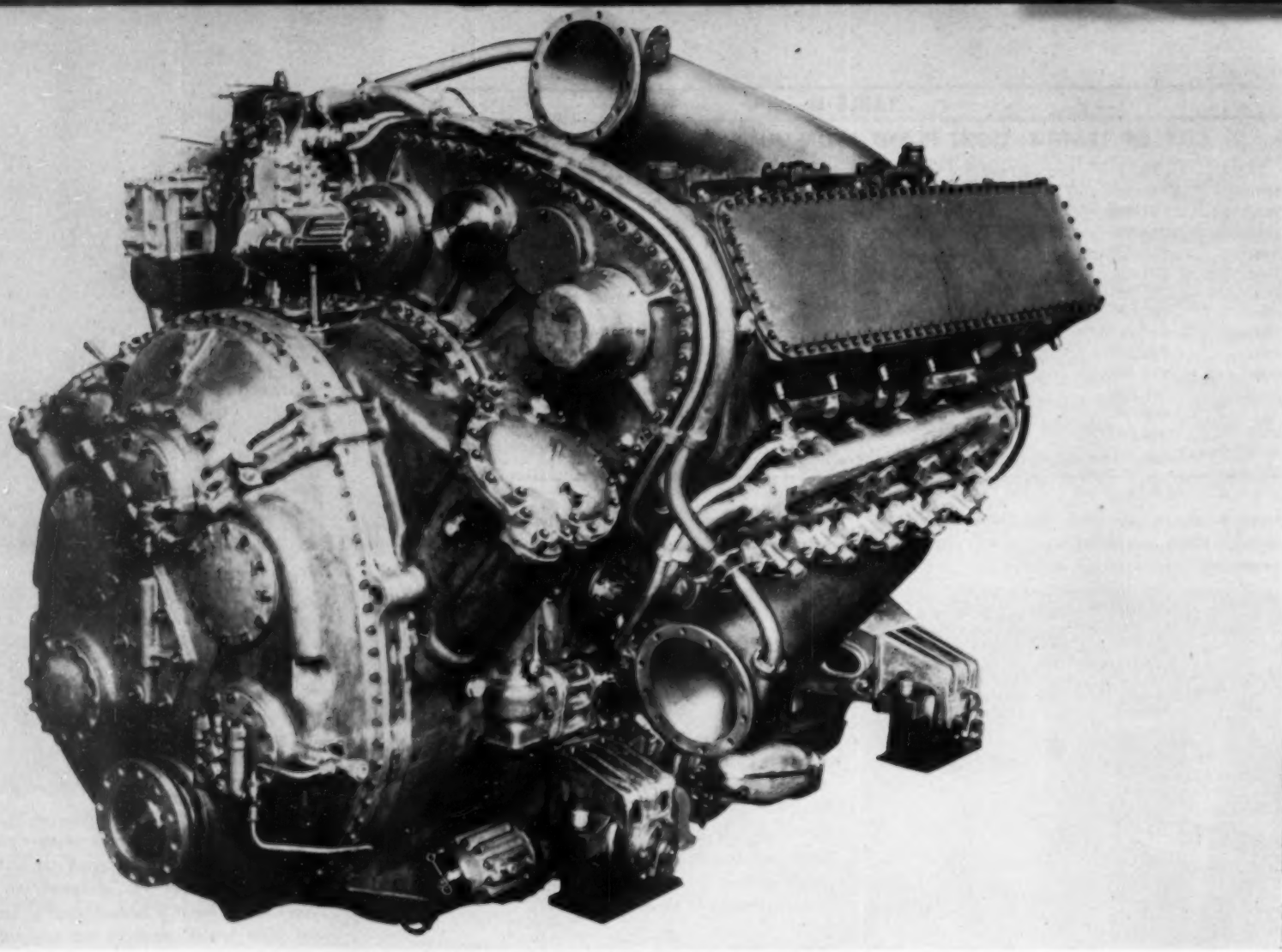
The new engine is served by a compact F-M gauge and alarm panel which includes an Alnor exhaust pyrometer.

Modernization of the electrical panel, control and feeder, was instituted with the installation of the 960 horsepower prime mover. The old system had the board away from the generator end of the units; however, a small masonry addition to the front of the plant provided space for the new panel located more conveniently at the generator end of the units. Circuit changes on the board can be made more readily due to a basement space under the board. Four feeder panel (2 business and 2 residential), one plant panel, and 2 extra panels for feeders were installed on the new board. Power is generated and transmitted at 2500 volts. The six panels were wired out of the plant to a pole where the tie to the feeders is made. Should trouble develop in any of the feeder panels, a short jumper could transfer the load served by that panel to one of the spare panels on the board. Just a little added insurance while the plant is prepared for further expansion.

The use of low cost natural gas, in a modern, efficient, Fairbanks-Morse, opposed-piston engine, operating in a well-run plant, is producing power at a fuel cost of half pre-gas service. Selection of the proper sized engine, coupled with the flexibility of this unit, enable the plant to carry economically loads from 150 kw. to 675 kw. with the cheaper fuel.

List of Equipment

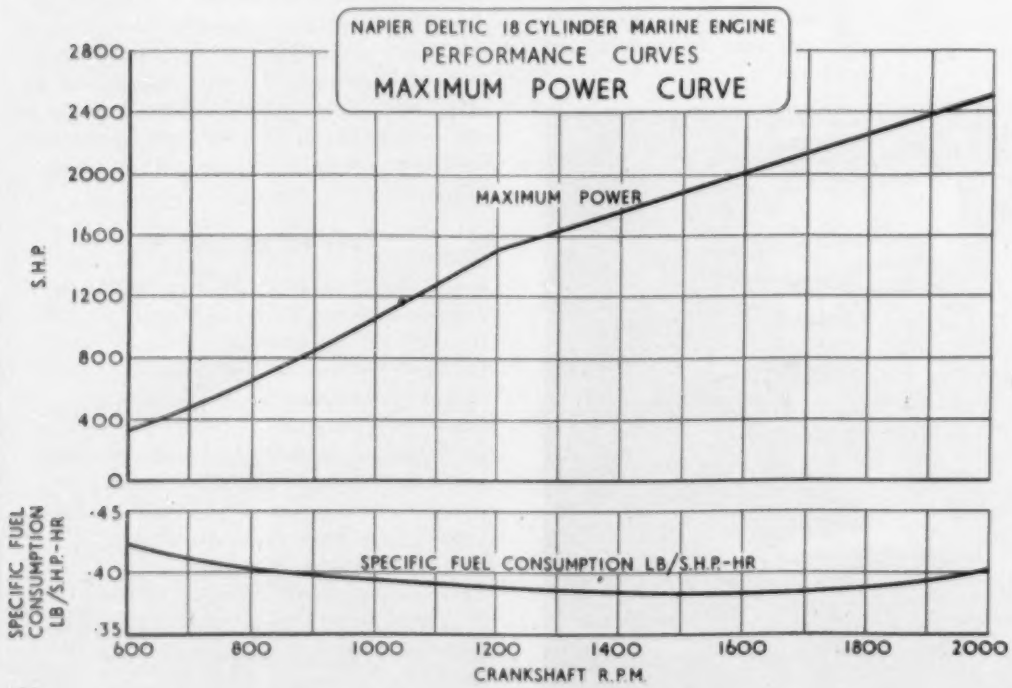
Engine—Model 38 D8⅛, 960 hp., OP, 2-cycle, 6-cylinder, 720 rpm. Fairbanks, Morse.
Generator—675 kw., Fairbanks, Morse.
Exciter—Belt-driven, Fairbanks, Morse.
Fuel pump—Engine-driven, Fairbanks, Morse.
Fuel oil filter—Nugent.
Lubricating oil—DTE No. 3, Magnolia Petroleum.
Lubricating oil pump—Roper.
Heat exchangers (water and oil)—Kewanee-Ross.
Lubricating oil filter—Fairbanks, Morse.
Exhaust silencer—Maxim.
Intake air filter—Cycoil, American Air Filter.
Exhaust pyrometer—Alnor, Illinois Testing Labs.
Switchboard—General Electric.



The Napier Deltic marine diesel, 2,500 bhp. The free end (scavenge blower) is shown.

THE NAPIER DELTIC MARINE DIESEL

NOW in production by D. Napier and Son, Ltd., of England, is the unusual Napier Deltic marine diesel. This two cycle, opposed piston engine was developed for the Royal Navy. The engine derives its name "Deltic" from the triangular form in which its pistons are disposed. According to the manufacturer, by arranging the cylinders in the form of a triangle the technical merits of efficiency and mechanical simplicity which are inherent in the opposed piston design are exploited to the full and its disadvantages are eliminated.



The components of the engine are small enough to permit the use of the most modern airplane engine materials and manufacturing techniques thus making possible the use of such items as fully hardened crankshafts, thin wall lead bronzed bearings and case-hardened and ground gears which at the designed ratings give extremely long life.

All parts of the engine, both individual components and major assemblies such as the reverse gear, phasing gear, scavenge blower, etc., are manufactured to be fully interchangeable. This has allowed the principle of "repair by replacement" to be adopted as a fundamental feature of the design, thus reducing down-time to a minimum. Although the Napier Deltic engine was produced in the first instance for marine propulsion, the technical merits of the engine open up a wide range of uses in other fields. In addition to the 18-cylinder model which is illustrated here, a 9-cylinder version is also being produced maintaining the triangular form but using three throw crankshafts.

The Napier Deltic diesel engine has a maximum shp. of 2500 at 2000 rpm. and a continuous rating of 1875 shp. at 1700 rpm., a cylinder bore of 5⅛-in. and a stroke of 7¼-in. The overall length including reversing gear is 10-ft. 11-in. The width is 6-ft. 2½-in. and the height is 7-ft. 1-in. Net dry weight of the engine only is 8,725 lbs., 3.5 lbs. per hp.

Two important technical advantages arise directly from the geometrical layout of the cylinders. First, there results automatically a phase angle difference of 20° between exhaust and inlet crankshafts. This phase displacement with the exhaust crankshaft leading permits the use of an extremely efficient porting layout for scavenging and cylinder charging. Second, each crankpin carries one inlet and one exhaust piston so that the loading on each crankpin, and therefore the power transmitted through each crankshaft, are identical. When this triangular arrangement is extended through the length of the six throw crankshafts, each shaft having a normal firing order (1, 5, 3, 4, 2, 6), the resultant 18-cylinder engine has equal firing intervals of 20°, giving extreme smoothness in running.

The patented triangulated unit which constitutes the main body of the engine is built up from three identical cast aluminum 6-cylinder blocks forming the sides and three cast aluminum crankcases at the corners. The two upper cases are essentially identical but the lower one has been deepened in section to carry engine bearers and to provide effective oil drainage. The resultant structure is held together by high tensile steel through bolts extending from each crankcase through the cylinder block to the other crankcase. These bolts carry all combustion loads, the cylinder blocks remaining in compression.

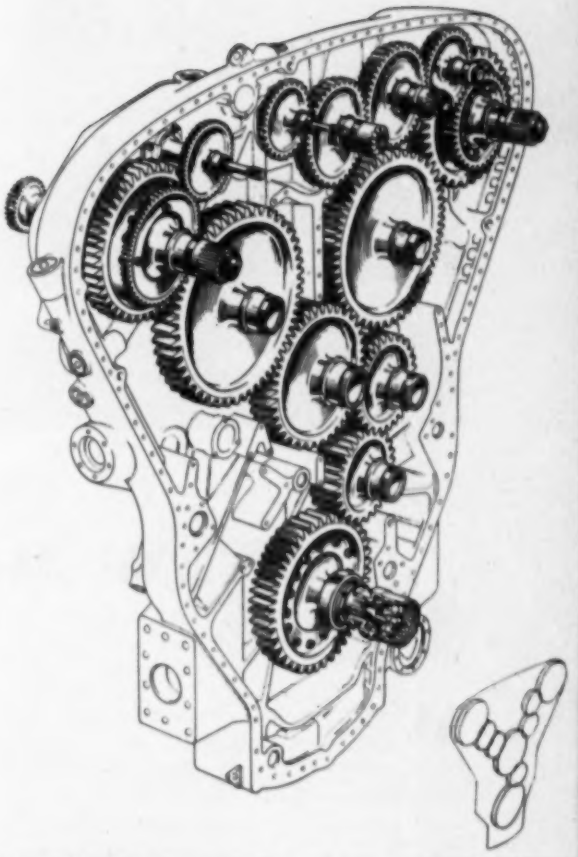
The cylinder liners are of the wet type and machined from hollow steel forgings. Bores are chromium plated and finished by lapping. Exhaust ports are machined around approximately half the circumference at one end, and the bars between the ports are water cooled. Inlet ports at the other end are provided around the whole circumference and machined with a partly tangential direction of entry thus imparting a swirl to the inlet air to assist in the scavenging process and to obtain efficient mixing of fuel and air in the combustion chamber.

Two injectors are provided for each cylinder. These are of the outward opening valve type and both injectors are fed with fuel from a single injection pump. The nozzles inject at a wide angle from the axis of the injectors. Pumps are of normal C.A.V. type modified to suit the requirements of the engine. Arrangements have been made in the diesel's design to allow any one pump to be removed and replaced with another, correct timing and matching being automatically achieved.

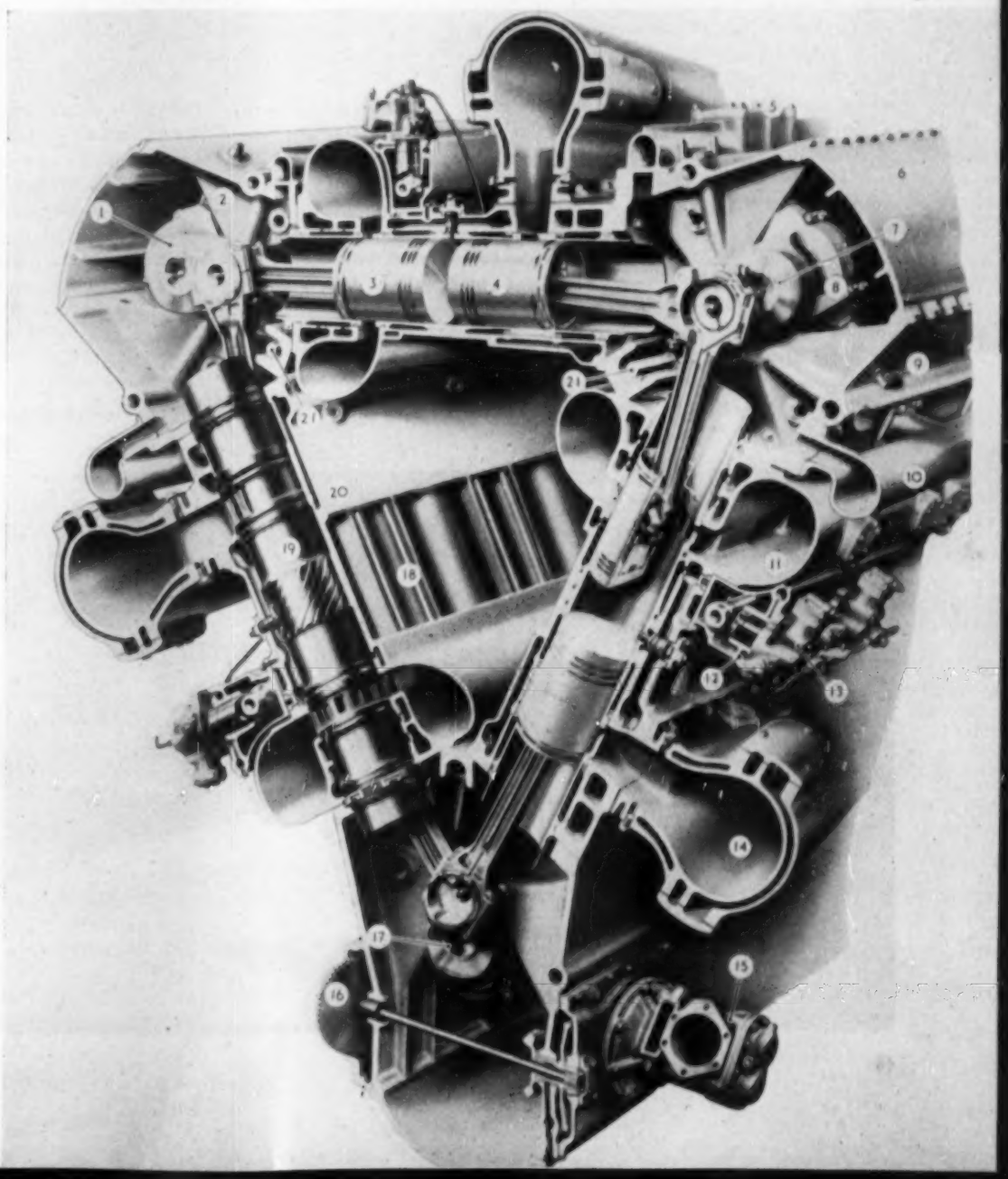
All bearings and gear meshes throughout the engine are supplied with oil under pressure, the system being of the "dry" sump type in which oil is returned to the tank by a scavenge pump. A sea water cooled heat exchanger is included in the scavenge circuit for oil cooling purposes, thermostats being provided to control the oil temperature. Engine cooling is provided by a closed system utilizing distilled water circulated through a heat exchanger by a centrifugal pump. Sea water is circulated through the cool side of the heat exchanger by a gear type pump. Thermostatic temperature control is provided.

The reversing mechanism takes the form of two constant mesh gear systems, one for running ahead and one for running astern, the appropriate gear train being connected at will by hydraulically loaded plate clutches. The clutches are connected to the output shaft from the phasing gear train and therefore run at slightly over crankshaft speed. Controls for the clutches are interconnected with the engine power control. The gear trains on the reversing gearbox also provide appropriate speed reductions, the crankshaft to propeller shaft gear ratios being 2.106 ahead and 2.397 astern.

The engine is started by a cartridge type starter in which a cartridge is fired into a cylinder containing a piston mounted on a helically splined shaft carrying a Bendix type claw coupling. The starter is mounted on the phasing gear casing, its claw engaging with a similar one on a gear meshing directly with one of the upper chankshafts. A rotary breech carrying five cartridges which are electrically fired forms part of the starter equipment.



Drawing showing the arrangement for phasing gearing.



Sectional view through the No. 5 cylinder seen from driving end. 1. BC crankshaft. 2. BC crankcase. 3. Inlet piston. 4. Exhaust piston. 5. Crankcase breather. 6. AB crankcase. 7. AB crankshaft. 8. Main bearing cap. 9. Crankcase tie-bolt. 10. Drain oil manifold. 11. Air inlet gallery. 12. "A" camshaft casing. 13. Fuel injection pump. 14. Exhaust manifold. 15. Sea water pump. 16. Fresh water pump and pressure oil pump drive gear. 17. CA crankshaft. 18. Cylinder block tie-bolts. 19. Cylinder liner. 20. "C" cylinder block. 21. Blower flexible drive shafts.

The *Creole C-148*, an offshore oil field crew boat built for the Creole Petroleum Corp. by The Paasch Marine Service Co. of Erie, Pa. It is one of a fleet of dieselized boats owned by the company. ←

Equitable Equipment Company, gulf coast builder at New Orleans, turns out this 38 ft. dieselized water taxi for both domestic and overseas customers. →

A NEW MARKET FOR SMALL BOATS

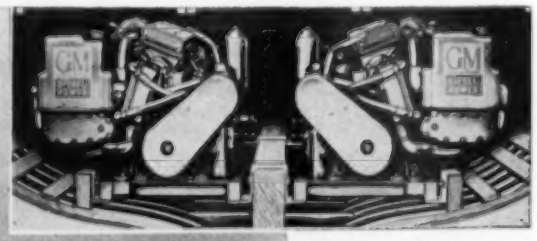
WHEN petroleum companies went to sea in the never-ending search for new oil deposits, their need for fast transportation of personnel to and from drilling rigs opened up practically a new market for the builders of small boats. Today with offshore drilling activities steadily increasing at home and abroad, the building of oil field crew boats has become almost an industry in itself. These boats are designed by some of the best known marine architects in the country. And builders in increasing numbers are turning out a product that is, of necessity, characterized by rugged construction with speed, high maneuverability and seaworthiness.

The boats run from 23 to 45 feet in length and carry from 12 to 25 passengers. They must be designed and built to operate with maximum safety and dispatch in either deep or shallow waters. For the added safety afforded by the use of non-volatile fuels, many of these craft are powered by "small boat" diesels now available. A Great Lakes builder in the field is the Paasch Marine Service Company of Erie, Pennsylvania. An accompanying illustration shows the Paasch-built *Creole C-148* designed by Philip Rhodes, marine architect of New York City. It is one of a fleet being built for the Creole Petroleum Corporation for overseas use, but Paasch is building similar boats for other major oil companies as well.

This model has an overall length of 45 feet and beam of approximately thirteen and a half feet. Its entire superstructure, including deck plates, is fabricated of aluminum. The cabin resembles the interior of a highway bus with all possible space taken up by seats for passengerse and pilot. The boat has a draft of only four feet but it is amply powered by a matched pair of General Motors model 6-110 diesel engines turning 27 in. by 28 in. wheels. With full passenger loads, a speed of 28 miles per hour is attained at 1825 engine rpm.

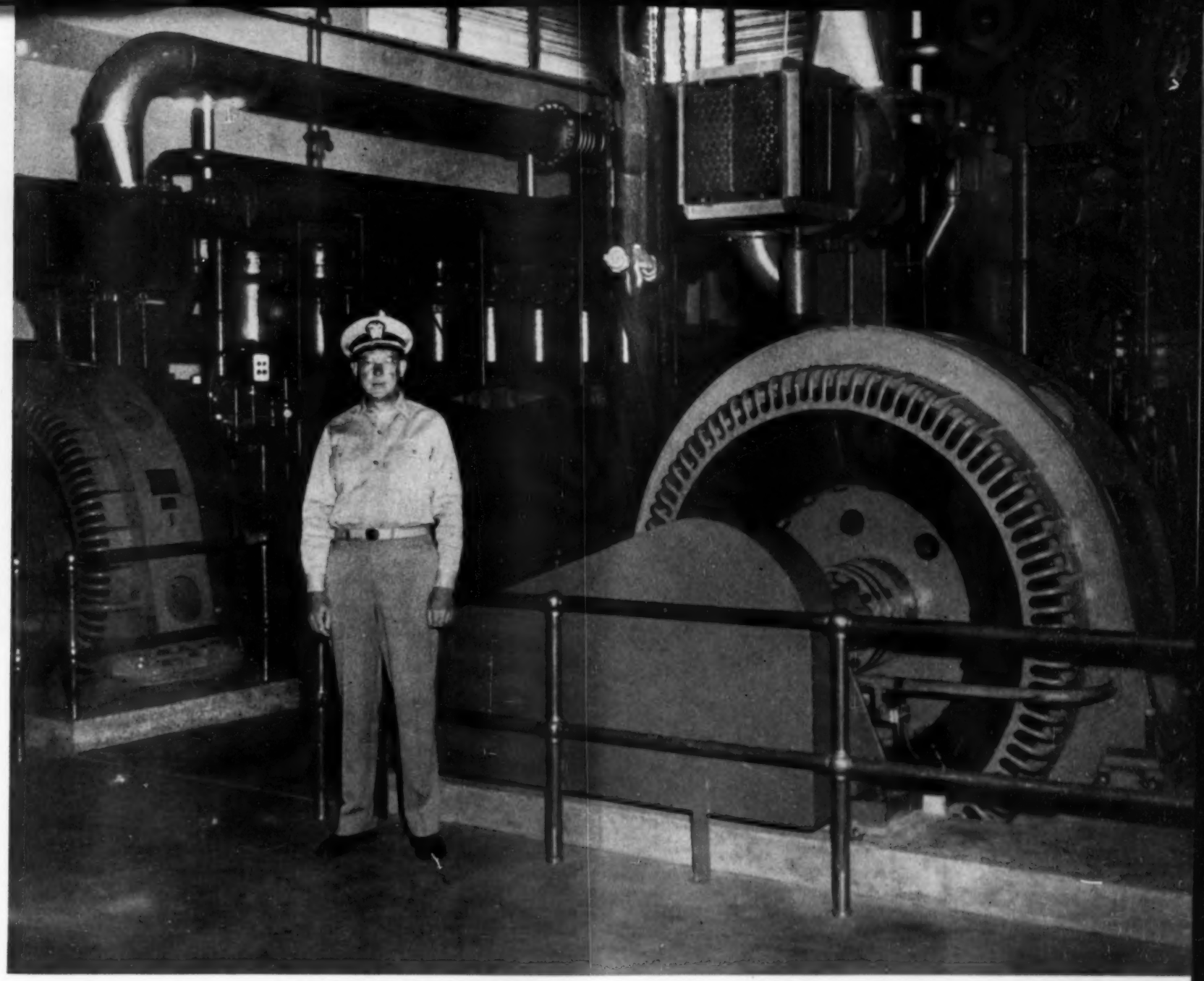
One of the pioneers in turning out this type of boat is Sewart Seacraft, Inc., of Berwick, Louisiana. One of their models is a 34-foot craft with 12-foot beam and a draft of only 32 inches. It is powered by a pair of General Motor's new inclined four-cylinder series "71" diesels turning twin-screws 22 in. by 22 in. With a passenger load of 12 men it moves along at speeds up to 26 miles per hour. Sewart turns out craft ranging from 23 to 38 feet in length. All models have all-steel, welded hulls.

The Equitable Equipment Company is another well-known Gulf Coast builder turning out water busses in yards at New Orleans and Madisonville, Louisiana. One of their popular models is a 38-foot, all-metal craft which accommodates 20 to 25 riders. It carries all available safety features and is built to withstand the heaviest seas likely to be encountered. Power is provided by matched pairs of General Motors 6-71 diesels. Equitable has shipped a sizeable number of these boats to South American countries in addition to those supplied to offshore drillers at home.



The pair of inclined, 4-cylinder "small boat" Detroit diesels which power the *Scoper*.

The *Scoper* is one of the oil field crew boat models built by Sewart Seacraft, Inc. of Berwick, Louisiana. The craft is owned by Clem Scobel and B. J Perz of Buras and New Orleans, La.



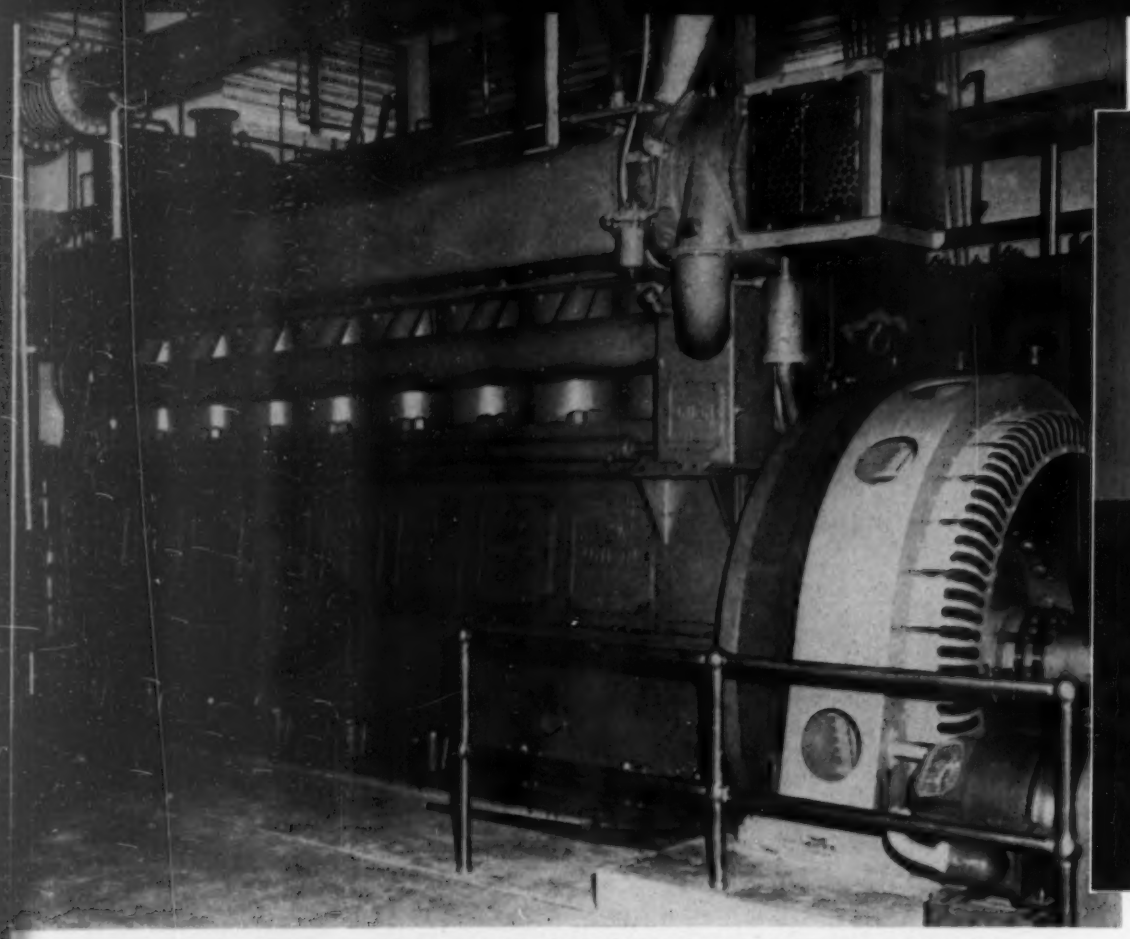
Captain Allyn Cole Jr., Officer in Charge of Wahiawa Naval Radio Station, standing in front of the two Union Diesels.

UNION DIESEL PLANT IN HAWAII

By BRUCE WADMAN

ON the beautiful Hawaiian island of Oahu, where the graceful palm trees sway with the gentle ocean breezes, and the surf rolls majestically on to picturesque tropical beaches, I set out to find a new diesel emergency generator plant that I had heard about up in the Wahiawa district, which is about twenty miles inland from Honolulu. Driving out to the plant with James I. "Johnnie" Takaki from Ben Hayashi Ltd., the contractors for this installation, I couldn't help but notice the lush, fertile tropical valley all around me covered with field upon field of sugar cane and pineapples. In the distance I could see volcanic peaks rising abruptly to form the borders of the valley. When we arrived at the power plant, I found to my surprise that it was surrounded by pineapple fields in all directions. Added to my astonishment at finding a diesel generating plant in the middle of a pineapple field was my admiration when I had a good look at the inside of the plant, which is as clean and well designed as anyone could ask for. The installation, completed in April, 1953, under a contract administered by Captain E. F. Peltier, District Public Works Officer, 14th Naval District, is utilized as emergency stand-by power for the Naval Radio Station at Wahiawa.

The main building is 72 feet long and 47 feet wide and is entirely of concrete construction, with corrugated louvers near the top of the structure to provide for ventilation. One part of the building is nestled in the side of a small hill. The power units consist of two diesel engine driven generators of 800 kw. capacity each, making a total generating capacity of 1600 kw. The engines are Union model V8 supercharged diesels rated at 1250 hp., but capable of delivering in excess of 1400 hp. for continuous operation at 360 rpm. These 4 cycle, 8 cylinder engines each directly drive a GE synchronous ac. generator. The generators are each rated



Side view of one of the 8 cylinder Union diesels with Elliott turbo-supercharger, GE 800 kw. generator and exciter, Nugent lube oil filter, Chicago Metal Hose flexible exhaust connector, and Union inlet air filter with Fiberglas pads shown.

GE switch panel for control of generating capacity and load distribution located against the rear wall behind the engines.

at 800 kw., 1000 kva., and 4160 volts with wye grounded. A GE exciter is connected by a v-belt drive to each generator. The exciters are dc. and 13.6 kw. apiece.

The engines are manually started and operated, but there is a GE switchboard that completely controls the engine speed and generating load once the engines are running. Starting air for the diesels is provided by two Gardner-Denver air compressors, one driven by a 7½ hp. electric motor equipped for automatic start and stop and the other driven by a small gasoline engine with manual control for use if there is complete electric power failure. Becoming better acquainted with the plant, I was impressed by the way in which the accessory equipment was installed.

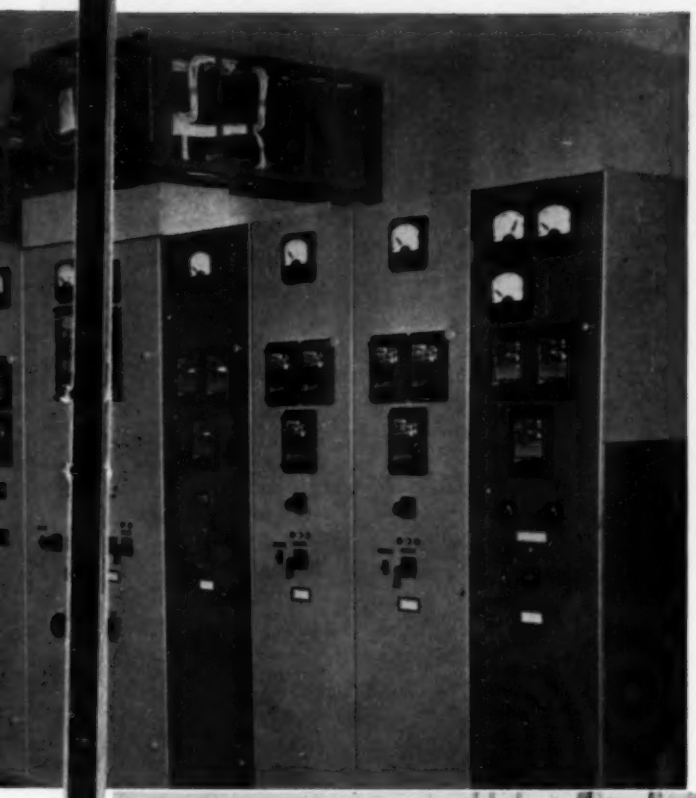
The engines are so designed that all service connections are located in the front end, thereby eliminating trenches and piping on the sides of the engines. Most of the connections and piping are sunk in covered trenches in the front part of the plant, and the air compressors and tanks, the Blackmer auxiliary electric motor driven oil pump, and the DeLaval lubricating oil centrifuge with clean and dirty oil tanks are all located against the front wall in a convenient position away from the engines themselves. This leaves the space around the engines clear and gives better access for maintenance and repair. There is a 5 ton capacity travelling electric bridge crane located under the roof above the engines to further ease maintenance and repair problems.

Another interesting feature of the plant is Union's own designed and manufactured complete, automatic system for the control of engine shutdown. Each Union diesel has an electric alarm system with visual and audible indication and an automatic shutdown device which will be actuated by any of the following six conditions: overspeed, loss of pressure of lubricating oil, loss of pressure of jacket cooling water, excessive temperature of lubricating oil, excessive temperature of jacket cooling water, excessive generator bearing temperature.

The alarm and shutdown system is powered by a 125 volt dc. battery, and there are switches located in the oil and jacket water system and in the generator bearing, which when one of the above conditions arises, energize both the alarm and shutdown systems. A Pierce governor is employed to actuate the overspeed shutdown automatically. The main engine governor is a Woodward of the hydraulic type, with speed droop and load limit adjustment. The exhaust pyrometer is a Brown combined indicating pyrometer and rotary switch.

The lubricating system is of the wet sump, full pressure type with a Tuthill positive displacement lubricating oil pump; a by-pass type Nugent lubri-

Outside of the plant showing Marley Evaporative Coolers and ventilating louvers of the building.

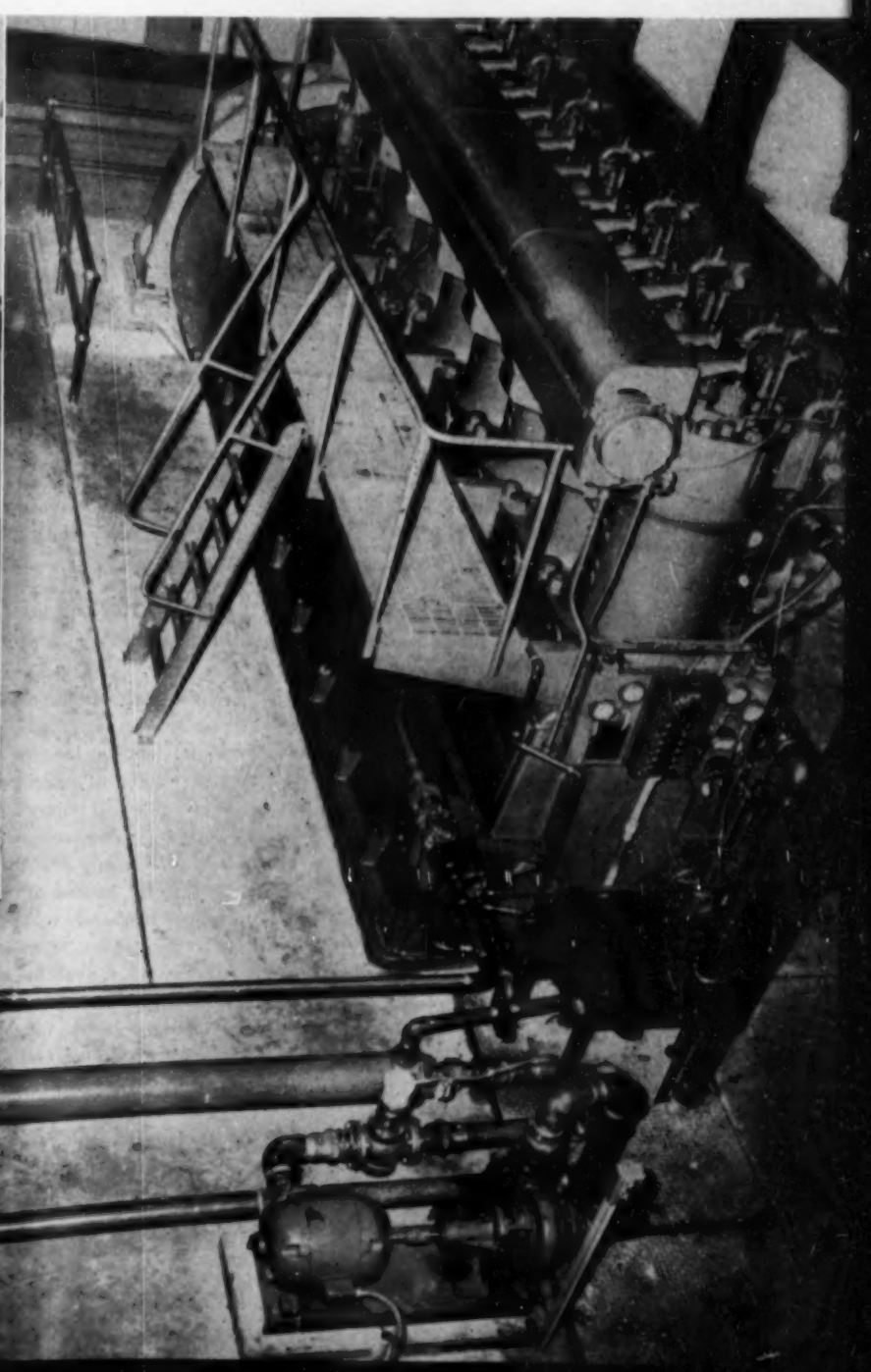


cating oil filter is provided on both engines. The DeLaval centrifuge is utilized to periodically clean the dirty oil from the engines and is equipped with an intake and discharge pump. Each engine is provided with a Marley evaporative cooler, the cooling towers being located on the side of the main plant building. The cooling system is an open cooling arrangement. It contains a by-pass from the cooling towers until the water is heated up to proper engine temperature, and then is set up so that the water passes directly through the Marley cooling towers and then right back into the engine after first flowing through a Union shell and tube type lubricating oil cooler. A 7½ hp. electric motor driven jacket water pump is located at the front of each engine. The fuel oil flows from gravity tanks through a Cuno knife-type fuel oil filter and then through Union's own mechanical-injection, constant-pressure type fuel system. The main fuel tanks are located underground behind the plant, and the water supply is obtained from a near-by well. An Elliott exhaust gas driven turbo-supercharger is installed on each engine, and a panel type Union designed inlet air filter with Fiberglas Corp. pads is attached on the turbo-superchargers. The engines exhaust through Maxim silencers located on the front of the main plant building.

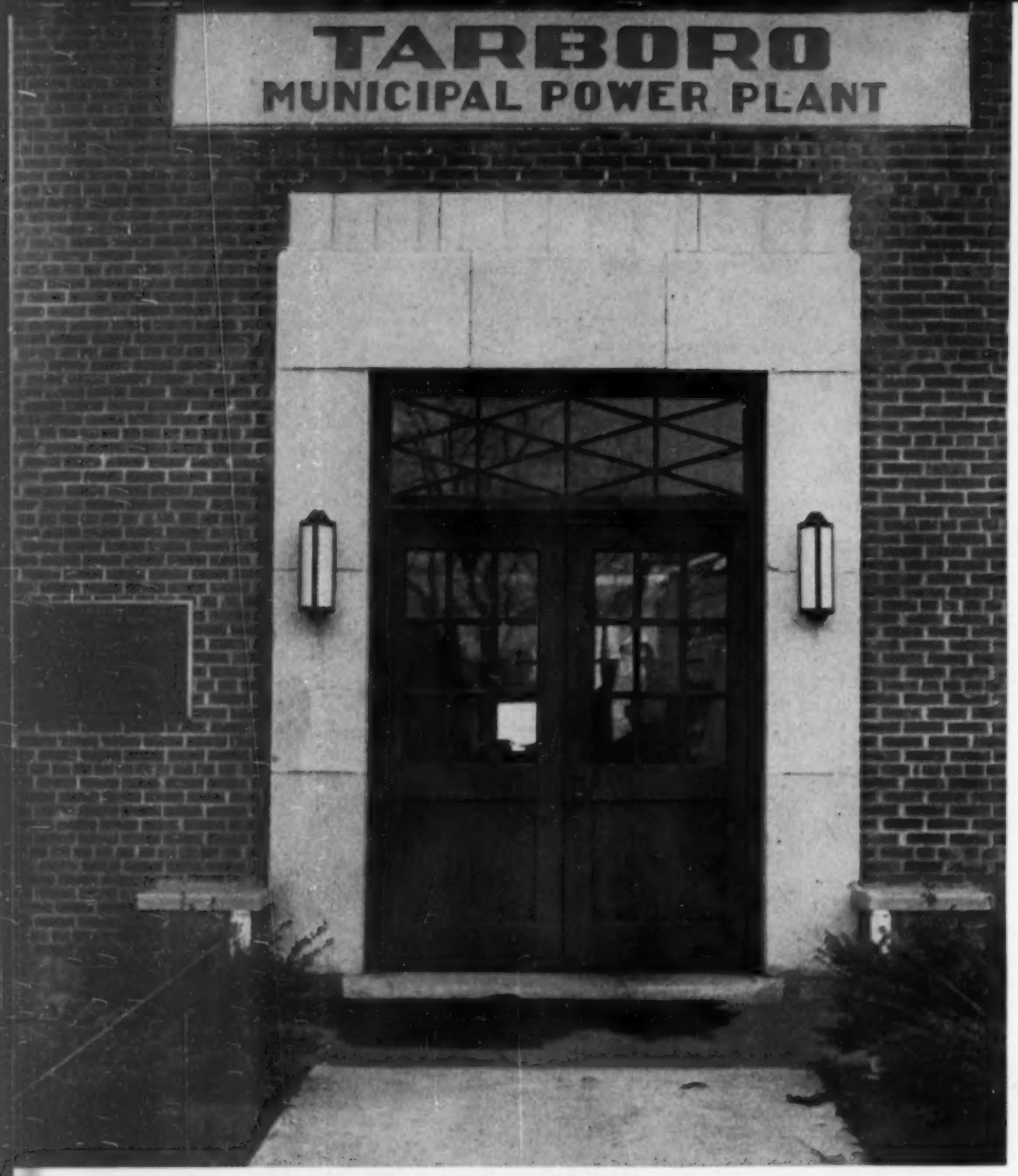
An interesting item on this installation is the size of the engine flywheels. They are solid steel plate, 86 in. diameter, and weigh 3 tons apiece.

Captain Allyn Cole Jr., Officer in Charge at Wahiawa Naval Radio Station, and Captain Richard E. Elliott, Commanding Officer of the Naval Communication Station on Oahu, are very proud of this brand new diesel plant and were vociferous in praise of its operation in the official tests and in all the service runs made so far. "Johnnie" Takaki was also noticeably pleased with the installation as he called my attention to the various features of this fine plant; he even included opening the huge electrically operated sliding door that takes up about one half of the side of the main building as part of my tour. Sincere appreciation goes to John Wasson of Von-Hamm Young Co., Ltd., Hawaiian distributor for Union Diesel, for his cooperation and assistance on my tour of this plant. The Wahiawa diesel stand-by plant, with its large total generating capacity of 1600 kw., has been designed for continuous duty and is capable of carrying the load at all times. I find it to be an excellent example of how a large plant, with proper planning and designing, can be successfully adapted to emergency power generation.

Gardner-Denver Air Compressors and air tanks, Blackmer auxiliary lube oil pump, and clean lube oil tank adjoining the DeLaval centrifuge (not shown in picture) to the right. These are all located against the front wall.



Front end of one of the Union diesels, showing all the service connections, the Cuno fuel oil filter, the Union automatic alarm and shutdown panel, Brown Pyrometer, the Union heat exchanger for lube oil, and the jacket water pump with Fulton Sylphon regulator control.



TARBORO, NORTH CAROLINA

By R. M. WEATHERLY*

OPERATION of three Worthington diesel generator units on heavy #5 fuel oil instead of more expensive light diesel fuel has reduced per-kilowatt fuel costs by approximately 34 percent for the Town of Tarboro, North Carolina, in its Municipal Light and Power System. Supplying the town of 8,000 people, county seat of Edgecombe County, and its dozen small industries with an energy output that has already reached 3550 kw., this plant has been one of the pioneers in the burning of heavy fuels. Long a municipal operation, the station was converted to diesel generators in 1928 with the installation of two MacIntosh & Seymour 900 hp., 8 cylinder air injection units. Load conditions dictated the installation of a larger diesel, a 1250 hp., 5 cylinder, Nordberg engine in 1937 and finally, in 1949, the town constructed an entire new wing on its power plant and installed three 1760 hp., 16 x 20 in., four cycle, supercharged, Worthington diesels, each developing rated horsepower at 360 rpm. The three latest units now carry 80% of the total load.

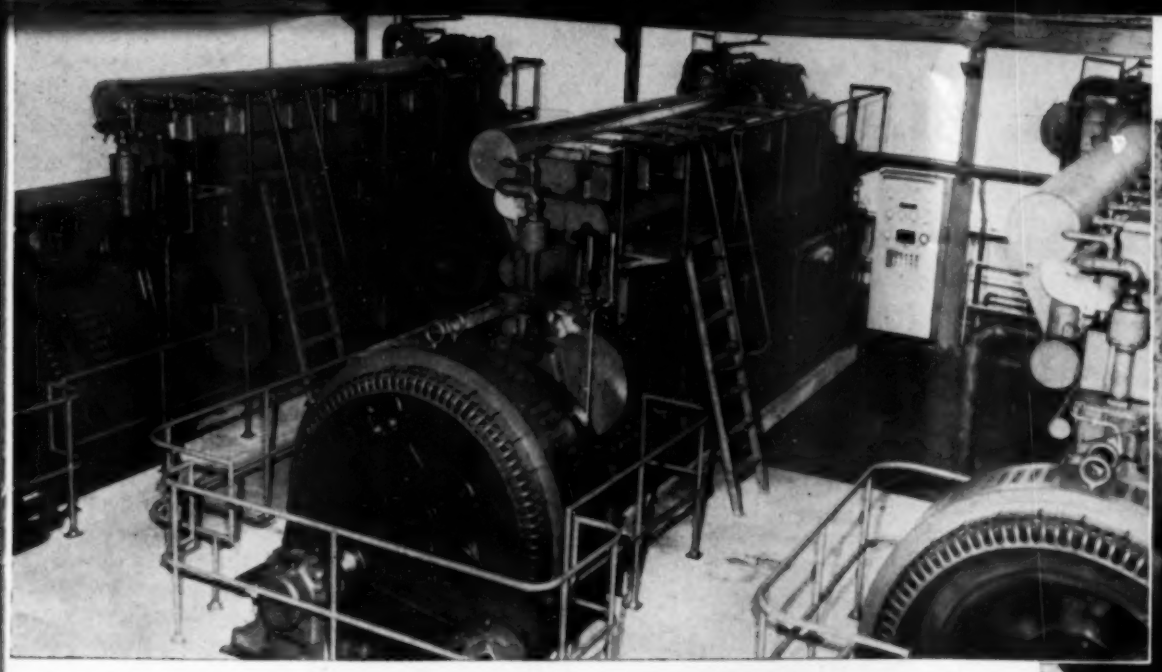
Manager, Municipal Light & Power System, Tarboro, No. Carolina.

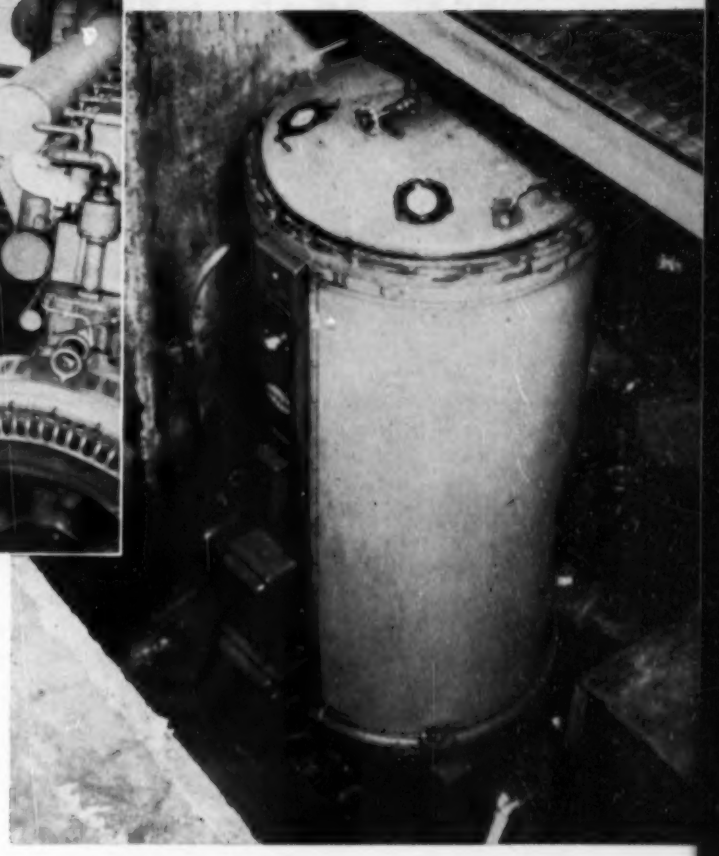
At the time the latest plant expansion was being planned, the high cost of light diesel fuel led town officials and engineering consultants to select engines capable of burning a cheaper, heavier oil and to design a fuel system for efficient handling of the heavy fuel. The fuel now in use has an API gravity of 15.5, viscosity S.U. 250 at 100°F., sulphur 1.59 and ash .04. Because of the fact that the heavy fuels are not sufficiently volatile to enable their use until after the engines have been started and thoroughly warmed up, a dual fuel system has been necessary. Providing light oil for starting purposes, this dual system also insures reliable operation regardless of auxiliary equipment failure or the unavailability of any given type of fuel oil. Outdoor storage facilities consist of one large tank with a capacity of 120,000 gallons of #5 fuel oil and three smaller light oil tanks with a total capacity of 36,000 gallons. Fuels are shipped by rail from Morehead City, N. C.

The fuel system is highly flexible permitting the operator to use either of two fuels or any combination of the two. Actually, there are two complete fuel oil systems which merge at the engine selection valves. By setting these valves, the engines can be run off either system. The light system has one day tank with one line feeding from the light oil storage. From the light oil day tank, the oil is pumped through a cotton filter to the selection valves. The heavy oil system has two day tanks, the first of which is a blending tank with fuel lines feeding from both light and heavy oil storage. Both feeder lines are equipped with meters so that fuel from either storage tank can be measured and controlled. The fuel from the blending tank goes through a centrifuge so that fuel from either storage tank can be measured and controlled. The fuel from the blending tank goes through a centrifuge to the second day tank with the excess returning to the blending tank. A pump picks up oil from the second tank and pumps it through electric heaters and filters to the selection valves. From this point, whichever oil is chosen is pumped by the engine pump through an electric heater and edge-type filter to the injection pumps.

At present, the plant uses a No. 2 oil in the light oil system and employs it for starting and stopping the Worthington engines and at times for regular operation. In the heavy oil system, the plant uses No. 5 fuel oil without blending and the blending tank in effect serves as a day tank for noncentrifuged fuel. Centrifuging removes an average of four pounds of solid material per thousand gallons. Since excess oil pumped into the second day tank returns to the blending tank, it again passes through the centrifuge with a consequent increase in solids removal. Initially, the heavy fuel handling system was designed with capacity to serve just two engines at a time and consequently, under present operating procedure, two of the Worthington units divide the major share of the load operating on heavy oil with the third Worthington and the Nordberg handling most of the balance, operating on light oil. This plan will continue in effect until the fuel system can be enlarged to the point where it can handle sufficient heavy fuel for all three Worthingtons. When this has been accomplished, the rest of the units will be used primarily for standby service unless the load curve continues its present ascent.

While each engine has its own jacket water system, an ingenious piping arrangement permits diverting heated water from an engine in operation to the system of an engine that is out of service. This permits, with the use of auxiliary pumps, circulation of heated water for any desired period to insure that all parts reach operating temperature prior to start-up. In normal operation, jacket water and lube oil are circulated by the engine pumps and cooled in shell and tube heat exchangers. Raw water is the cooling medium and is in turn cooled in a natural draft cooling tower. Volumetric efficiency of the new engines is increased by exhaust turbo-chargers which send air into the cylinders at three pound pressure, and the exhaust gases, after passing through the turbine side of the superchargers, discharge to a battery of silencers located at the rear of the plant.





Three 1760-hp., 16 x 20 in., 4-cycle, supercharged Worthington diesels carry the bulk of the load using a No. 5 oil as fuel.

Lubricating oil for each Worthington engine is cleaned in a Honan-Crane purifier. There is also a Honan-Crane unit for use on the heavy fuel.

Although routine maintenance and overhaul has been scheduled at intervals consistent with the requirements established by operating experience, increasing loads have made it difficult to remove the units from service as scheduled. Load studies are now under way to determine the feasibility of adding another unit. Chromium plated piston rings, now almost standard in automotive practice, are used in the top two grooves of each piston in one engine and shows excellent promise of maintaining compression and reducing oil consumption for long periods. Their use may be extended to the other two Worthington engines.

Also sure to be continued is the policy of purchasing engines that can use natural or manufactured gas as fuel. The present engines are so designed and, while natural gas is not now available, the low cost of this fuel is so attractive as to preclude the ordering of anything other than a dual-fuel engine, so that Tarboro can take immediate advantage of the economical fuel if present efforts to secure a gas supply are successful. Specifically, the new engines produced in the fiscal year ended June 30, 1952, a total of 12,084,800 kwh., while consuming 705,039 gal. of heavy oil and an estimated 146,247 gal. of light oil. The units generated approximately 84 percent of their total production on heavy oil, the rest on light. Fuel cost per kwh. is just 5.1 mills on heavy oil compared with 8.5 mills for the same engines on light oil. Thus, the use of No. 5 fuel results in a saving of 3.4 mills for each kwh. produced with the heavy oil, or a saving of $34,000 on fuel for the year. It is also true that the new engines are the most efficient prime movers in the plant in fuel consumption so that their fuel cost, averaging 5.66 mills for combined light and heavy oil output, is a full 44 percent under the 10.0 mills for the older units on light oil. At current fuel prices and the production rate of the last fiscal year, this represents a saving on the new engines of more than $52,000 a year on fuel oil, compared with what it would have cost at the old engine rate. Table I shows some comparative figures on fuel costs and consumption for the year ended June 30, 1952.

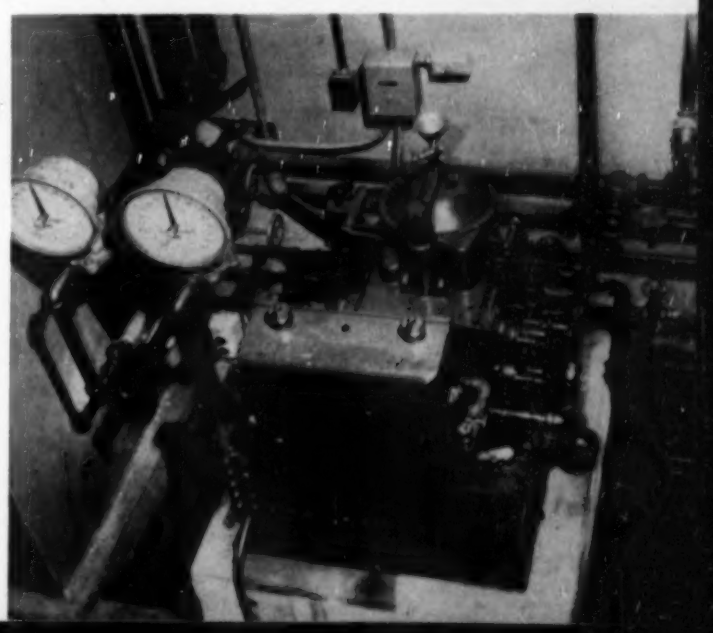
The fuel savings achieved at Tarboro have made possible a recent reduction in rates to the consumers, always welcome and particularly so at a time when other consumer costs are rising. The municipal electric department is operated by the author, Manager R. M. Weatherly, under the supervision of Mayor H. I. Johnson and two Commissioners of Light and Power, R. M. Fountain (Mayor Pro Tem) and Dr. E. L. Robertson.

TABLE I

WORTHINGTON ENGINES:	
Total Output (kwh.)	12,084,800
Heavy Oil Operation	
Output on heavy oil	10,130,000
Kwh. per gal. on heavy oil	14.4
Fuel cost, mils/kwh	5.1
Light Oil Operation	
Output on light oil	1,954,800
Kwh. per gal. on light oil	13.4
Fuel cost, mils/kwh	8.5
Total Worthington Operation	
Kwh. per gal. fuel	14.2
Fuel cost, mils/kwh	5.66
OLDER ENGINES:	
Total output on light oil (kwh.)	2,520,000
Kwh. per gal. fuel	11.4
Fuel cost, mils/kwh	10.0

List of Equipment

Engines—Three 1760-hp., 16 x 20-in., 4-cycle diesels operating at 360 rpm. Worthington Corp.
Generators—Three 1557 kva., 4160/2400 volt, 3-phase, 60-cycle. Westinghouse.
Auxiliary lube pumps—Three. Worthington.
Lube oil coolers—Struthers-Wells.
Lube oil purifiers—Honan-Crane.
Lube oil—Esso HD. Esso Standard.
Heat exchangers—Struthers-Wells.
Cooling water pump—Worthington.
Fuel oil centrifuge—DeLaval.
Fuel filters—U. S. Hoffman.
Fuel oil purifier—Honan-Crane.
Starting air compressor—Worthington.
Switchboard—Westinghouse.



The heavy fuel oil is put through a DeLaval centrifuge to remove excessive solids.

THE M/V "PAUL BLAZER"

By DAVID I. DAY

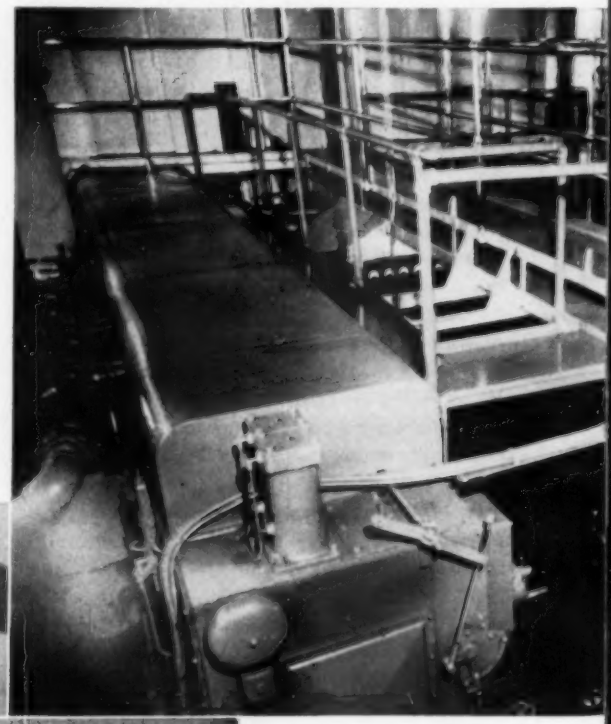
WE WERE first impressed with the inherent greatness of the M. V. *Paul Blazer* of the Ashland Oil fleet in early September, 1946. On many occasions we had seen the towboat previously, usually on the Ohio River. At all times she had seemed just another 135-foot all-steel twin-propeller pusher of which all the navigable river channels were full. On the morning in mind she pulled into the Northwestern Refining Company terminal in St. Paul Park, St. Paul, Minn., behind the biggest tow of the year to that dock. She was handling without the least apparent difficulty eight heavily loaded barges of crude oil, brought up from Wood River, Ill.

In common with most river enthusiasts who were at the moment at the head of upper Mississippi River navigation, we knew the big tow was coming and about when it would arrive if no unusual navigational difficulties were encountered on the long journey up. The tow added to 66,000 barrels and as it came up the crooked channel of the upper reaches of the Father of Waters, the newspaper boys were out, the cameras were clicking, and all the river world became aware that the *Paul Blazer* was helping the river transportation people break some records. Already the total tonnage moved far exceeded the complete season on the upper river in 1941, the first year the *Paul Blazer* had been in service. When the *Blazer* pushed up her record 66,000 barrels of crude, the total for the upper stream had passed 3,000,000 tons.

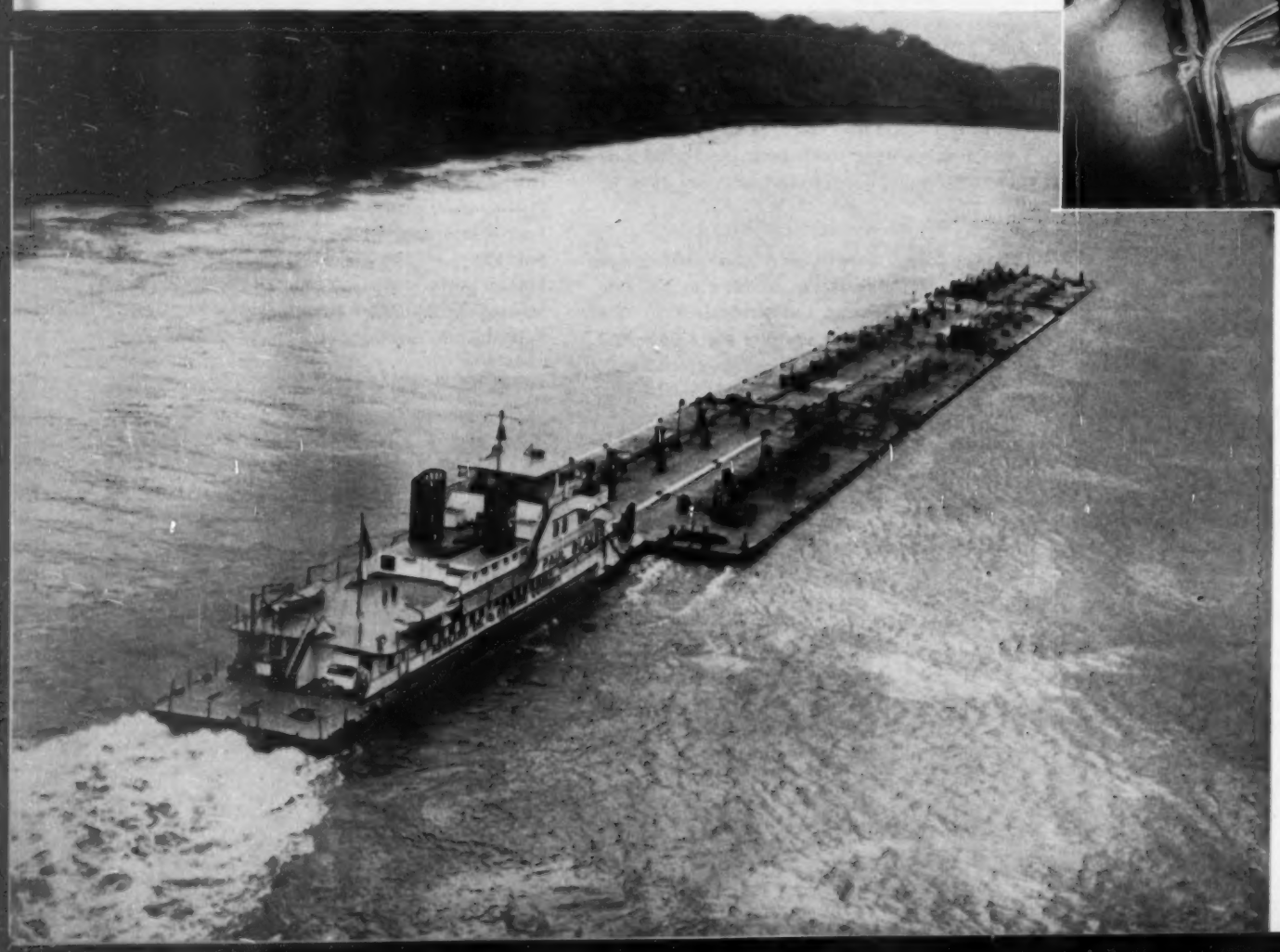
One of the old-timers in St. Paul, a veteran of old colorful river rafting days, had clung all along to the fallacy that steam power could stage a comeback. But when the *Blazer* reached her destination, he called off the fight. "So far as I'm concerned," he remarked bleakly, "an old era has passed. The day of the diesel is most definitely here." By way of coincidence that very day a letter reached us from a Marietta, O., friend discussing the towboat from a more sentimental angle. At the meeting just closed when the letter was mailed, the Sons & Daughters of Pioneer Rivermen had witnessed the presentation to the River Museum there of the first model of a diesel towboat to be added to the famed museum collection.

This scale model had been made by Capt. Fred Way, river historian, a former pilot and master of the M. V. *Paul Blazer* and he had the honor of the formal presentation. Witnessing the event as a special guest was Paul Blazer himself, chairman of the board of the owning company, the Ashland Oil & Refining Company, Ashland, Ky. At the Marietta river folks' convention, a part of the talk had been of the fact that the *Blazer* was proceeding gradually northward on the Mississippi with the impressive tow of crude.

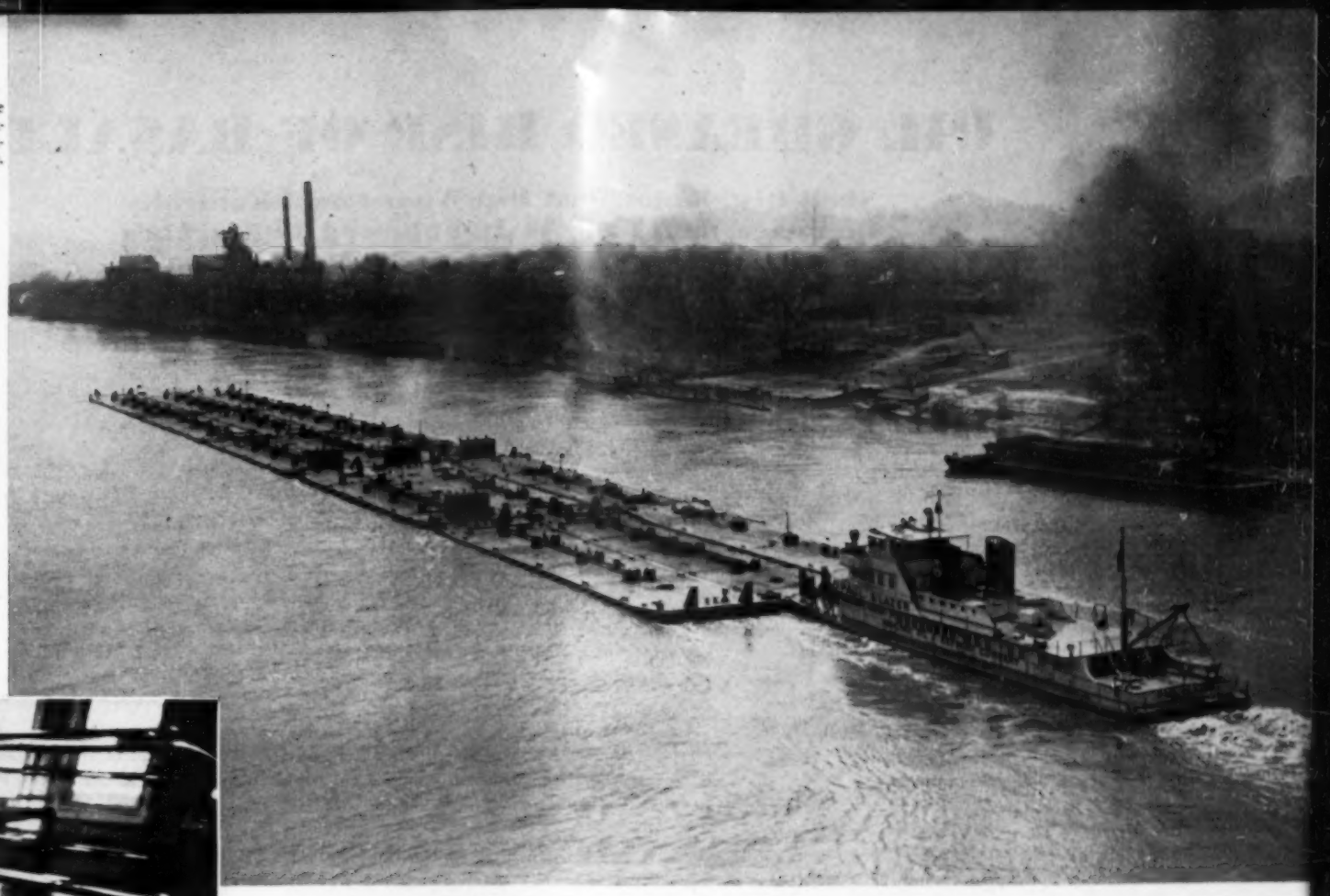
Built in 1940 largely and launched in 1941 at the Calumet Shipyard & Dry Dock Co., Chicago, the vessel, something over 135 feet in length, 31 feet in beam, and 6.5 feet in depth, was early recognized as a result of fine design by the noted A. M. (Gus) Deering of Chicago, another floating monument to this man's genius. While fundamentally an Ohio River boat, a long trades southern oil pusher, it was remarked in many quarters that her best river-length publicity had resulted from a big tow taken to the very head of Mississippi River boating. We quote from a letter received from a riverman in Keokuk, Iowa, the week following the arrival in St. Paul of the 66,000-barrel load: "I think," he said, "that in all my 45 years on and along the inland waterways I have never had anything assure me so strongly as to the future of river transportation as the way the *Paul Blazer* behaved on her memorable trip up. The manner in which she handled her barges approaching and leaving our 'bottleneck lock' was a subject worthy of a nation's newsreels."



The engine room of the *Paul Blazer* with her two National Supply Superior engines. They originally developed 1600 hp. Now they produce approximately 2200 hp.



View of the *Paul Blazer* and a tow before the improvements were added.



The *Paul Blazer* after the improvements were completed. Here she is pushing fifteen loaded barges.

At one time this great boat was merely hull 126 at the Calumet yards. There is nothing seems more lifeless than the empty hull of a future towboat. Every hull, if of the same model and material, appears identical. But no two engines seem to be exactly alike. Each unit has something of its own "personality." As in automobiles with the gasoline engine, it is the case in towboats using diesel engines, some are good and some are indifferent—from the same shops and assembly lines. In this connection we are reminded of a statement made not long ago by Harry F. Clark of the National Supply Company, engine division, in Springfield, Ohio, who has always admired the *Blazer* and her day-by-day river performance. "I remember," he commented, "that we shipped the two 14½ x 20 rail injection engines in individual shipments, Sept. 21st and 26th, 1941 for that hull 126 which eventually became the *Paul Blazer*."

For most folks along the rivers and intracoastal canals after a dozen years of notable service in days of both war and peace, the hull became the *Paul Blazer* as soon as the National Superior engines were installed and "hooked up." From 1941 to 1946 when she made her famous trip up to St. Paul, the life of the boat had been, indeed, a rugged one. She traveled the length of the rivers, night and day, long periods without rest. Today, the style is to build boats with more power. We have all seen the 5000-horsepower pushers on many rivers. But the *Blazer* with engines supercharged, direct drive, boosted by Kort Nozzles can boast of only 2000 hp. at 300 rpm. Yet we believe we could, without consulting him at all, safely quote Robert Gray, Marine Superintendent of Ashland to the effect that the staunch old *Paul Blazer* has been a whale of a good boat.

As the *Blazer* grew older and widened her prestige, she increased her power, or had it done for her. The rail injection diesel engines were converted in 1946 to a turbocharged installation. At the present time, Superior's Model 80, a 14½ by 20 unit has jerk injection. This model was designed and is manufactured with the idea of later supercharging in mind. The original installation on the *Blazer* was not so designed. The addition of turbochargers was not merely routine in this case. On the contrary, it was quite a job and one of interest to the various engineers in the Ashland fleet. Then came 1948 with Kort Nozzles installed at Dravo yards, the rate of power upped to a total of 2000 hp. With today's Model 80 from Superior, twin engines can develop 2880 hp. an indication of the improvement made from year to year in the marine diesel engine field.

All the file figures in the world mean little to the masters, mates, pilots, and engineers on the waterways. Merely saying the *Paul Blazer* had increased power from 1600 hp. to 2000 hp. made but a slight impression. But when the towboat began pushing 15 instead of eight barges, there was plenty of recognition from New Orleans up the Ohio and elsewhere. As one of the mates working for another long-trade diesel vessel had it in a card to the writer: "We have visual evidence." Usually spoken of as a 2000-hp. boat (as we have done in this article), Marine Superintendent Gray of the Ashland fleet figures actual performance at around 2200. He mentioned some of the reasons back of the boat's working over and the improvements resulting.

Later, we might add, radar was installed on the boat, and as all noted along the channels Dravo designed, constructed, and installed the new and improved stern. At this point, the 15-barge tow became the standard load of the boat, each barge being 195 by 35 feet. A number of other useful but less noticeable improvements were made at different times.

The original equipment of the towboat is still of interest and in use. The air compressor from Gardner-Denver uses a motor from Burke Electric Co., with Cutler-Hammer starters and a check of Calumet records indicate the air conditioning units were from Fairbanks-Morse with the fan motor driver from American Blower. Fairbanks-Morse supplied the fire pump, and in the original list of equipment we observed a lathe and a drill press, both manufactured by Atlas.

OIL GREASED RISE OF BASALT

Shell Distributor Just Did What Came Naturally in Peace and War As It Followed California's Modern Development With a Rock Mountain to Quarry, Roads, Ships, Pipe Construction, etc.

By F. HAL HIGGINS

ORDINARILY the writer finds the men in the Oil Industry know their products and how to sell and service them for transportataion, industry, agriculture, mining, logging, heavy construction and any other mechanized demands in their fields.

So, it was a bit surprising to the visiting interviewer who called on the management personnel of Basalt Rock Company, Incorporated, at Napa recently to find that this firm not only got its start as a distributor for Shell Oil Company products before starting to quarry and process its "big rock candy mountain" on the south edge of the city of Napa, but it still has the Shell account. All its diesel, as well as the lighter gas-powered equipment is 100% Shell for fuel.

"We started in the quarry business in 1924," replied Equipment Superintendent J. F. Rodgers in answer to questions as to when each important step in the development of this multiple-sided business was made. "That overhead tram that carried material from the quarry across the main highway down to a plant was put into use in 1928. It was the thing that the general public recognized as being a signpost for our quarry, of course, as you suggest. That crawling overhead bucket train of rock remained there till 1936.

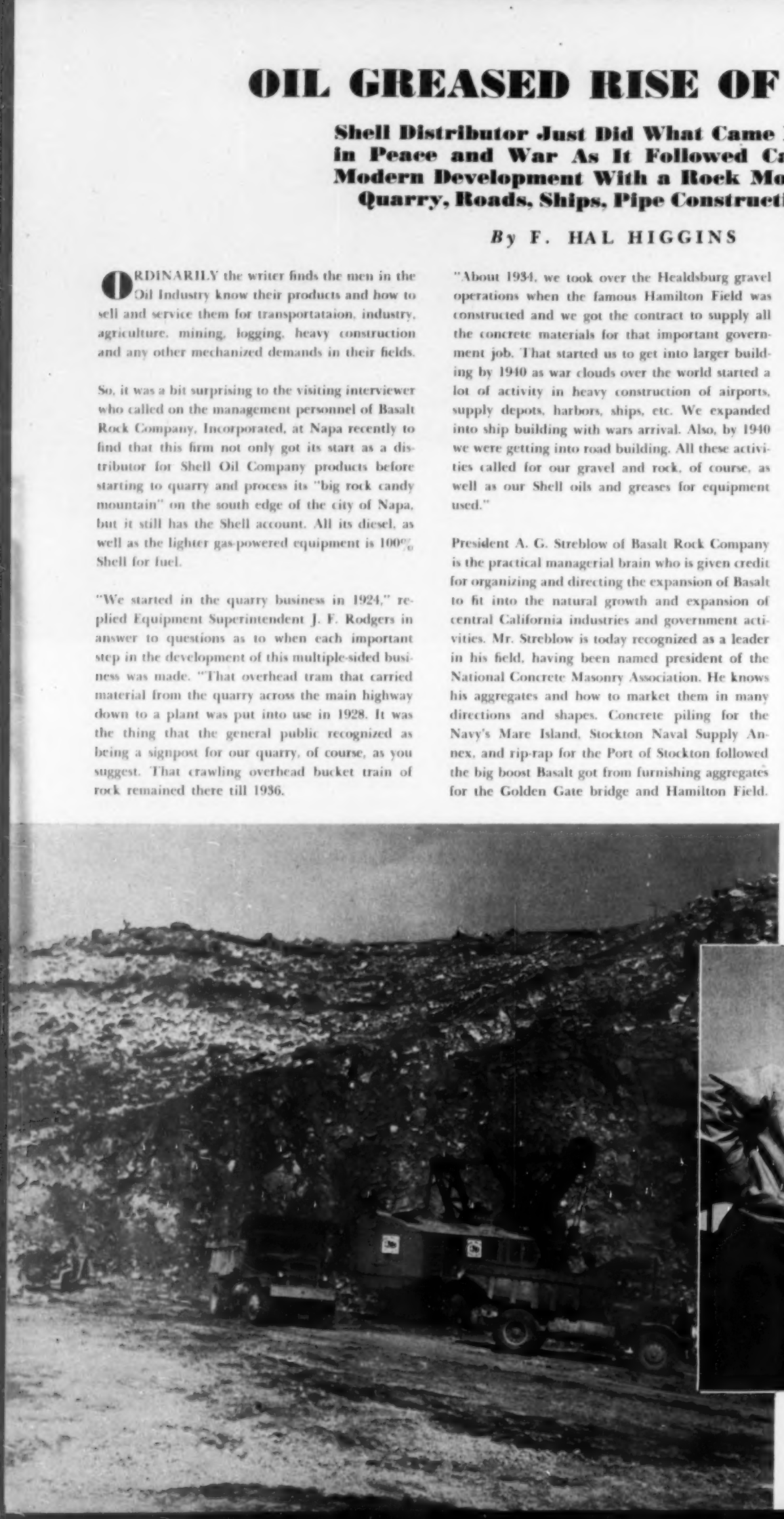
"About 1934, we took over the Healdsburg gravel operations when the famous Hamilton Field was constructed and we got the contract to supply all the concrete materials for that important government job. That started us to get into larger building by 1940 as war clouds over the world started a lot of activity in heavy construction of airports, supply depots, harbors, ships, etc. We expanded into ship building with wars arrival. Also, by 1940 we were getting into road building. All these activities called for our gravel and rock, of course, as well as our Shell oils and greases for equipment used."

President A. G. Streblow of Basalt Rock Company is the practical managerial brain who is given credit for organizing and directing the expansion of Basalt to fit into the natural growth and expansion of central California industries and government activities. Mr. Streblow is today recognized as a leader in his field, having been named president of the National Concrete Masonry Association. He knows his aggregates and how to market them in many directions and shapes. Concrete piling for the Navy's Mare Island, Stockton Naval Supply Annex, and rip-rap for the Port of Stockton followed the big boost Basalt got from furnishing aggregates for the Golden Gate bridge and Hamilton Field.

That inexhaustible mountain of rock which the Basalt company has been quarrying for nearly 30 years has supplied much flood control rip-rap as well as for the wartime construction around the San Francisco Bay area. Rip-rap stone supplying got the firm into big construction, officials agree. It also got Basalt into the barge building business. One of their engineers designed an all-steel barge with unloading device that eliminated cranes.

Basalt blocks for construction go way back to the near East of the earliest construction in biblical days. The word means stone that yields iron and the product weighs about 40% less than ordinary concrete blocks. That makes it attractive and the company has been working with builders and architects to give them shapes and sizes for economical and attractive construction of business and residence demands. The firm really pioneered the light weight building block industry in California.

Basalt took on and so successfully and speedily filled Navy ship building contracts that it was the first company to win the Navy "E" on the West Coast. Y-O tankers were built for the British as well as ARS salvage tugs for the U. S. Navy. With war over, the mushrooming auto industry as well



Cat D8 at far left in the open pit quarry of Basalt Rock Company, Napa, California. Center, an electric Bucyrus-Erie shovel loads two Euclid rear dump trucks.

At the Basalt quarry: Quarry Superintendent Cossani, left, talking over job problems with Equipment Superintendent J. F. Rodgers.

A Cummins-powered Euclid used as a switch engine in spotting cars for loading and making up trains at the old boat building plant where pipe is now made. The dieselized crane on rail car works at loading and unloading pipe for rail freighting.

as the stepped-up trend to change-overs from coal to gas and oil fuels in industry and homes was a made-to-order opportunity for Basalt to go from ships to pipe as easily as the firm had swung from rip-rap and piles to boat building. The old wartime ship yards are a busy pipe-making, loading and shipping scene today. Recently pipe ordered for one of the Big Inch lines was filled to the tune of 1800 miles of this product. To meet the building construction rush for Basalt blocks that came like an avalanche following war's end, a second plant for Basalt block was opened at Stockton in 1947. Three machines at each of the Napa and Stockton block plants turn out 12,000 blocks per day. The latest Basalt block, put on the market scarcely two years ago, is "Strestcrete," pre-pressed steel and lightweight concrete units for fast economical commercial and industrial construction.

In addition to the light weight block plants at Napa and Stockton, and the aggregate plant at Healdsburg on the Russian river, Basalt has ready-mixed concrete plants at Vallejo and San Francisco, and a Rocklite block plant at Ventura that supplied the new Statler hotel at Los Angeles with much of the aggregates used in its construction. There is also the quarry at San Rafael. All these scattered plants fit nicely into the Basalt company plans for California's future. To show how the diesel engine powers the Basalt operations, the writer asked Mr. Rodgers to list the equipment owned and operated in powering Basalt's operations.

"At Napa, we operate six 15-ton rear dump Euclids powered with Cummins engines. One Mack LFT semi-trailer with Cummins engine. 8 Caterpillars— 3 D8s, 2 D7s, 2 D4s, 1 D2.

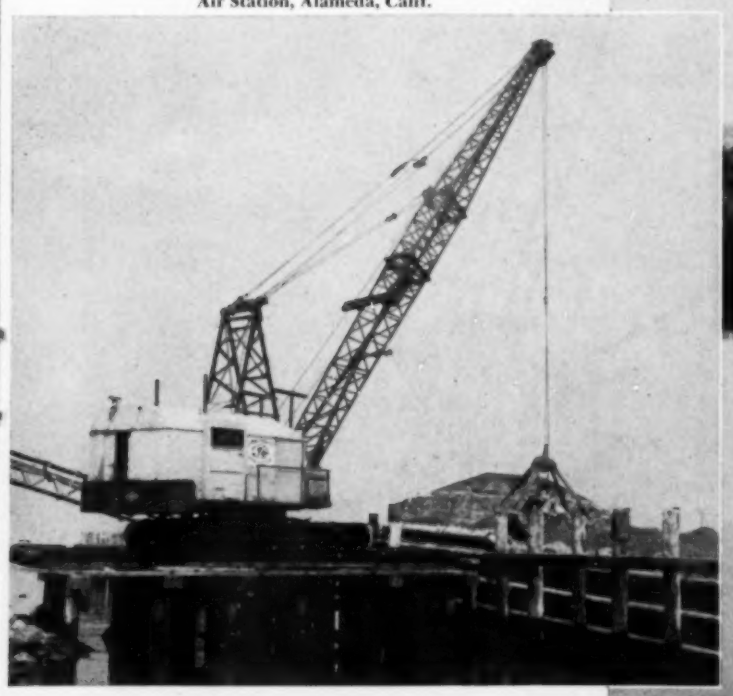
At San Raphael plant rock quarry: 6 more Euclids like at Napa. 3 Euclids bottom-dump Cummins.

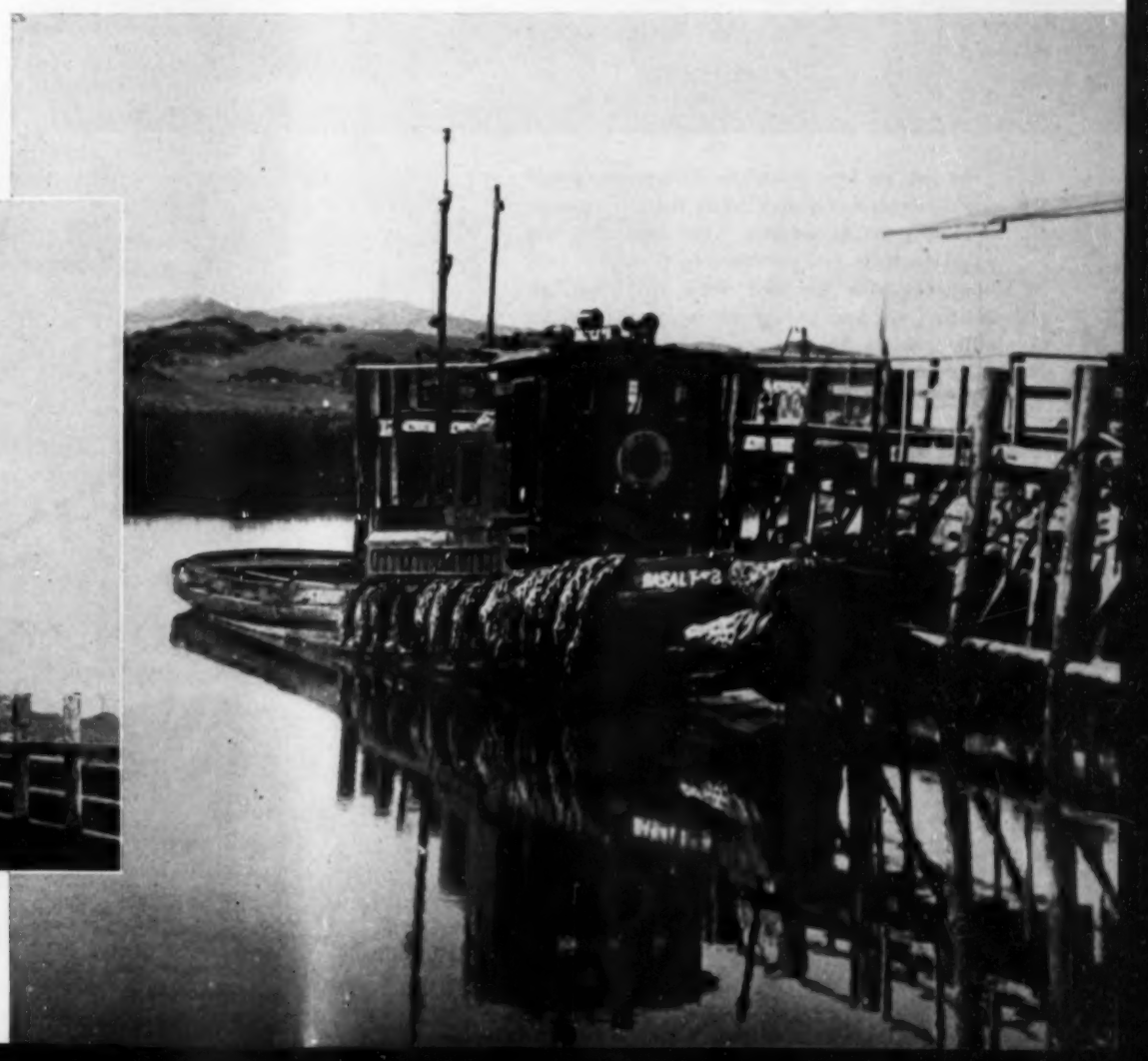
At Healdsburg, 11 bottom-dump Euclids with Cummins engines. 3 Cat 17000s in American cranes.

At Alameda air base, 1 Northwest 80 with Murphy engine on construction.

Two towboats, powered by Atlas and Enterprise diesels, handle the water carriers at the old shop building plant near Napa for Basalt. Here is one getting ready to go out with a load of pipe.

Model 1301 Lima with 3-yard clamshell, powered by a Model L Cummins diesel and owned by Basalt. It is shown unloading barges at the U. S. Naval Air Station, Alameda, Calif.





These diesel-powered units move around and may be at one point or the other: 2 Ingersoll-Rand compressors with International UD18 engines. Two Cat. model 12 power blade graders. One Cat, model 112 power blade grader. Two towboats, one with Atlas, one with Enterprise engines. Two GMC 671 diesels in landing craft acquired from war surplus. One Bucyrus-Erie with Buda diesel engine.

"All Euclids bottom dumps, were originally bought in 1941 and in 1944 for the rear dumps. No torque converters have been installed, as we have level hauling on most work. The three electric shovels are a 3W Bucyrus-Erie at Healdsburg, a 120B of same make at Napa, and a mate to that at San Rafael. Those three 13000 Caterpillars are mounted on trailers and furnish juice for the jobs. The diesel fuel used is all Shell, though Union and Standard of Calif. products are used in some places.

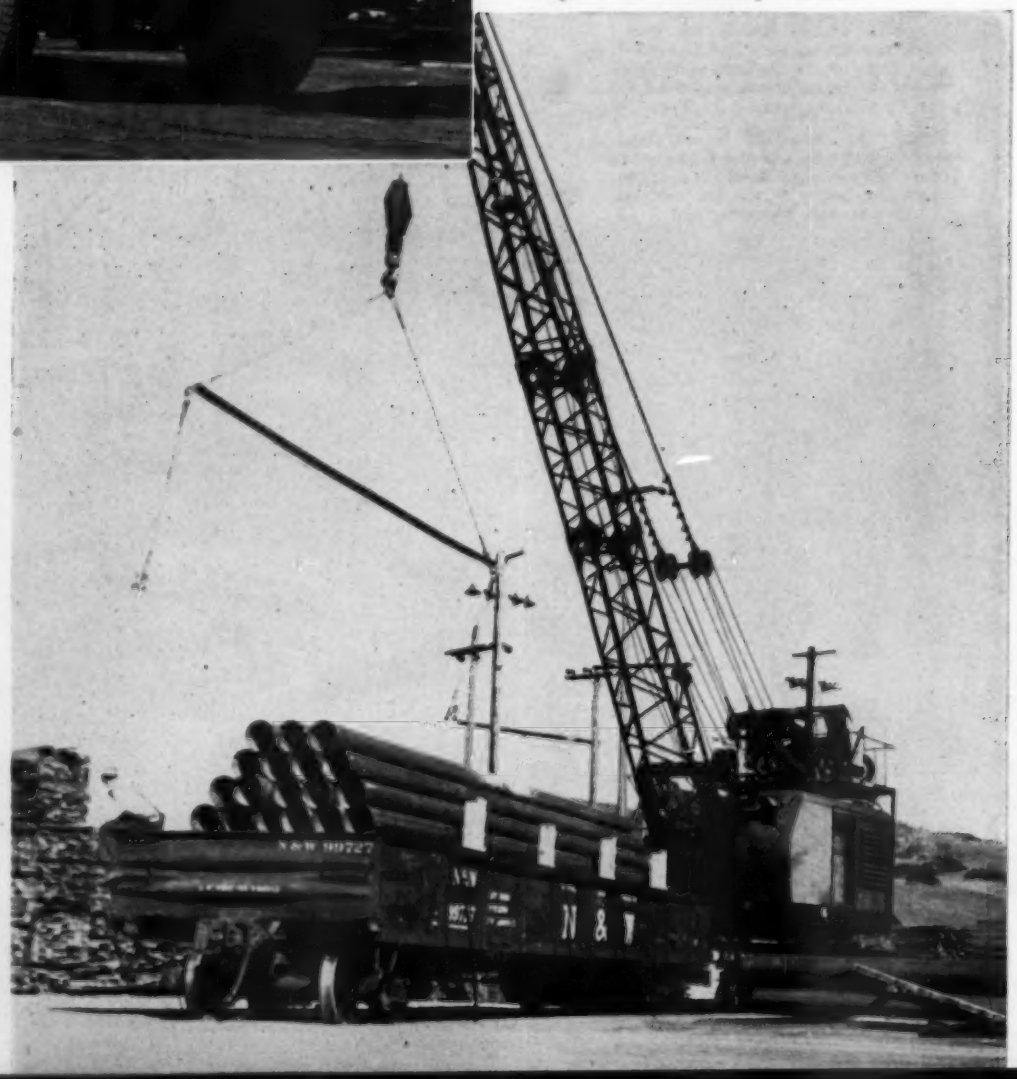
This American shovel with 2½ yard dragline was repowered in 1948 with a Model L Cummins diesel. It handles an average of 2000 tons of compacted sand and gravel every 80-hour shift. The Euclid has a 150 hp. Cummins.
—Photo Courtesy Watson & Meehan

Big Mack powered by Cummins waiting for a load of iron pipe.

Loading steel pipe at Basalt, three rail cranes work around the yard lifting, piling, loading and unloading. Caterpillar, Cummins, Murphy and Buda diesels power them.

"The jobs are kept practically dustless with paved roads except into quarry, water trucks sprinkling constantly in dry weather. That saves tires and lengthens their lives considerably. Goodyear, Firestone, Goodrich tires used, nylon adding life. An auxiliary shop at the quarry keeps the Euclids rolling. Every 80 hours work, oil changes and checks on this line's filters, tires, brakes, makes service fairly low and routine. Coming down from the pit is an 8% grade. Here is where the water brakes come into play. These are Parkerburg Hydrotarder, which can be set in one spot for the run down from pit with load at 10 to 25 mph., says Rodgers. This installation doubles life of the brake lining. The mileage from the Shell diesel fuel averages 6 miles per gallon. This job is now running two 10-hour shifts, following a 1-shift operation of six months. Changes like this depend on the state of business and demand for Basalt products.

"Basalt service shops require four men for the diesel equipment, two men caring for six diesels. But 10 men work fairly consistently on all heavy equipment—tractors, trucks, shovels, cranes. Total shop crews at top operation is 28 men."



Higher heat transfer efficiency year...after year...after year!

Trane fin and tube are "joined forever"

There is just no substitute for the *mechanically bonded* fin and tube when it comes to producing year-in, year-out efficiency in dry-type fluid cooling.

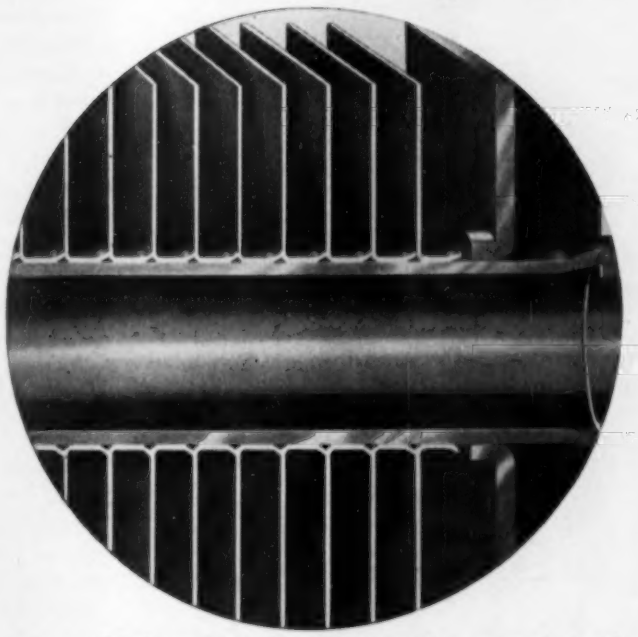
This fin and tube construction, developed and pioneered by TRANE, provides an extra heat transfer contact that lasts the life of the unit. No solder is used. Result: TRANE Dry-Type Fluid Coolers perform more efficiently year after service-free year.

Flat plate fin construction in these TRANE units gives other advantages. It offers less resistance to air flow and thus reduces fan horsepower required. It stays clean much longer than other types of fin surface. Any dirt or lint collected will be on the leading edge of the fin where it can be brushed off easily.

A variety of special corrosion-resistant metals can be used to meet your requirements exactly. And, for a wide range of applications, you'll find a complete line of TRANE Dry-Type Fluid Coolers in over 22 stock models and sizes, both vertical and horizontal.

Be sure you have all the facts on TRANE Fluid Coolers—and know the reason for their higher efficiency and lower per year cost—before you plan your next job.

Call your nearest TRANE Sales Office, or write The TRANE Co., La Crosse, Wis. for Bulletin DS-395.



These fins cannot loosen . . . despite a million expansions and contractions. They're *mechanically* bonded. The tube is expanded against the fin collars with tremendous internal pressure. This results in a union as strong and permanent as the metal itself. This strength, plus the extra heat transfer efficiency gained with the metal-to-metal contact gives TRANE Fluid Coolers a longer life and higher efficiency year after year.

TRANE GC Fluid Cooler, fan diameters from 6′ to 16′.

TRANE EC Fluid Cooler, 14 sizes, fan diameters from 18″ to 120″.

TRANE dry-type fluid coolers

can cut your cooling costs!

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

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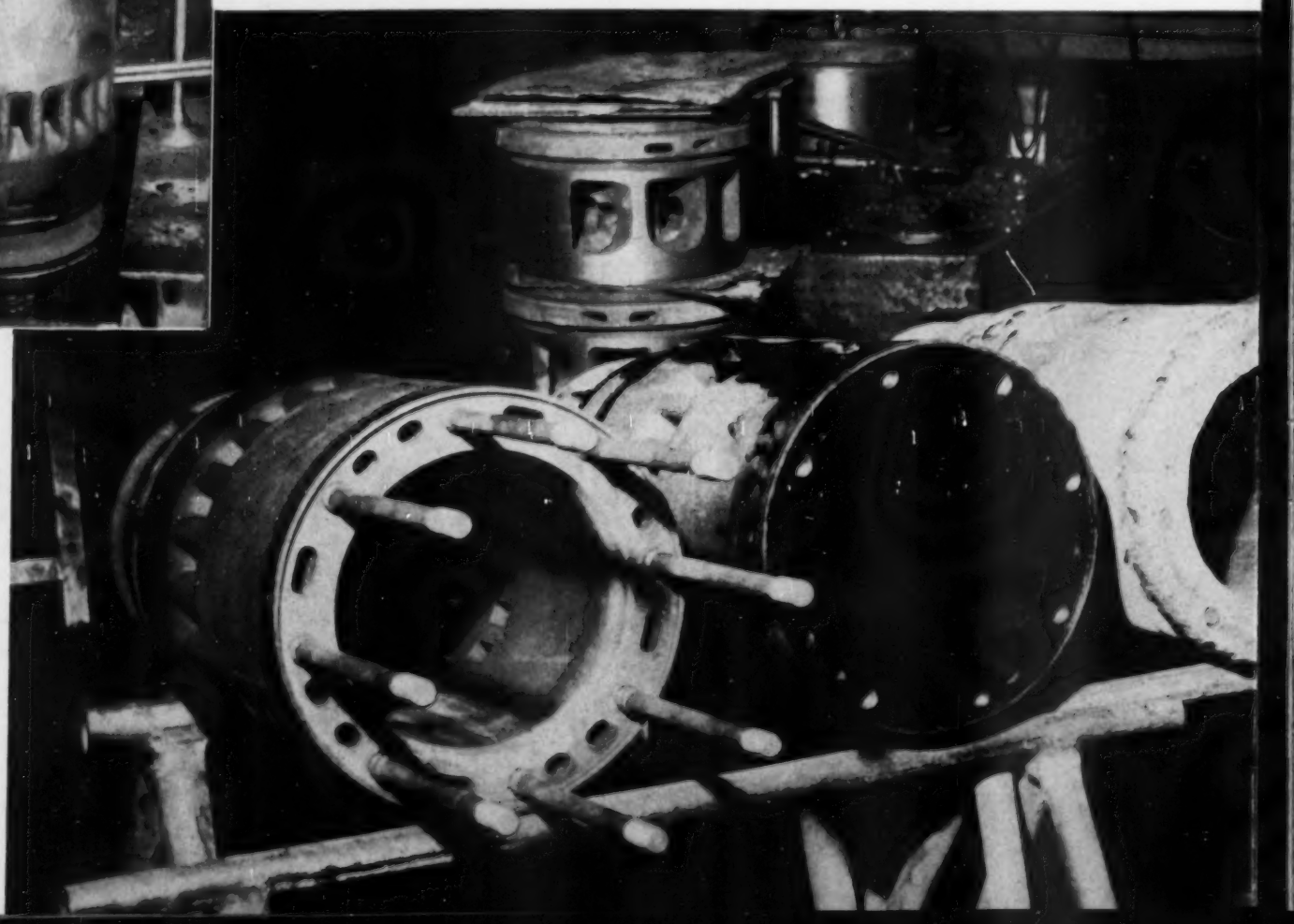
STUD REMOVAL SPEEDED

B. & D. Preheat Welding Co. Cuts Labor Cost of One Operation 75 Percent in Railroad Diesel Liner Modification Program

USE of one size 34U Ingersoll-Rand Impactool on a single operation has saved more than $6000 a year for the B. & D. Preheat Welding Co. of Silver Springs, Maryland. Since this electric impact tool was placed in service a little more than a year ago removing studs from railroad diesel cylinder liners, it has reduced time and labor costs for this operation a full 75 percent. Specifically, the firm processes an average of 50 liners per week and the stud removal, first step in a series of operations, now requires the services of one man using an Impactool for 2½ days each week. This work formerly required the services of two men for five days each week. Thus, a job which formerly required 80 man-hours is now accomplished in 20 man-hours with Impactools. This saving of 60 man-hours a week, at prevailing wage rates of $2.00 an hour, amounts to more than $6,000 a year.

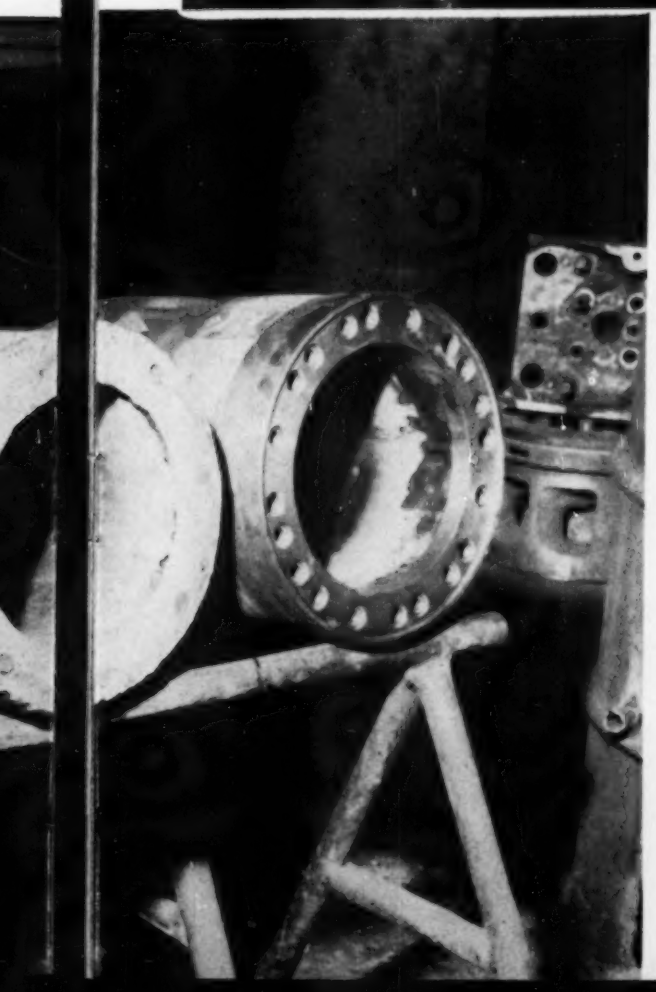
The firm started in business 11 years ago and initially specialized in the rebuilding of diesel bus engines. In recent years, the field of specialization has shifted to maintenance and modification work on big railroad diesels. B. & D. now has eight employees working primarily on railroad diesel engines for such large roads as the New York Central, the Baltimore and Ohio, the Central Railroad of New Jersey, and the Pennsylvania Railroad. The largest portion of the present work load is the modification of old-style cylinder liners. The process consists of converting the water passages between the liner and the head to the ferrule type. This relieves the head gasket of the job of preventing water leaks and reduces gasket failures.

The first step of the modification process is the removal of the eight ¾" studs from the upper end of each liner. Removing the cast-steel liner from its cylindrical cardboard carton, the operator places it in a holding fixture. Once the heavy liner is located in the simple fixture, made in part from two diesel engine poppet valves, the Impactool is put to work. Fitting a 12" hollow extension to the tool's 1" square driver, the extension is slipped down over the stud which is securely held in the extension with a taper pin driven at right angles to the extension and stud. To insure that the stud will not become twisted, the locking taper pin is at the bottom of the extension, as close as possible to the threads. Pulling the trigger switch starts the powerful electric motor and its power is transmitted to the work through the impact mechanism at the rate of 900 rotary impacts per minute. These repeated blows quickly loosen the stud from the



Here the operator uses the Ingersoll-Rand size 34U electric Impactool on the first of eight studs in a cylinder liner. Stud removal tool is held on stud with tapered pin at bottom.

These four cylinder liners show the various stages of conversion. The liner on the left is as received, the next shows the studs removed, the third shows the oblong water passages welded up and the fourth, on the right, shows the converted liner with round water pressure holes.



Rugged construction of the Ingersoll-Rand electric Impactool can be clearly seen as the operator sets tool in position for removing a stud from one of the cylinder liners.

tight-fitting threads, spinning it out is the work of seconds. After the studs have been removed, the gasket face is cut back to allow for welding and remachining. The weldment covers the entire upper end of the liner which is then remachined. Round water passage holes are drilled and reamed to size to accommodate ferrules and the stud holes are drilled and retapped.

The retapping operation is done with an Ingersoll-Rand size 8U electric Impactool using the tap chuck and standard taps. The light weight of this tool, combined with its freedom from torque reaction, makes it easy for the operator to cut true threads; no difficulty has been experienced in maintaining the close diametral tolerances required for force-fit threads. While comparative time studies have not been made at this writing, it is estimated that actual tapping time is cut more than 60%.

The size 34U Impactool is also used for removing two 1" studs from the diesel engine cylinder heads sent to the firm for reconditioning. Although these larger studs have been literally baked into position, their removal is no more of a problem than is the removal of the ¾" studs from the liners. After the studs have been removed, the valve gear is disassembled and the head is cleaned of all carbon deposits. Old valve seats and guides are removed and replaced with new ones and the valves are either refaced or replaced. After the valves have been reseated, the heads are given a final cleaning and returned to the customer, ready to be reinstalled in the engine.

Time saving has not been the only dividend paid by the Impactools. Operator fatigue has been reduced considerably. Using hand tools, the liner stud removal job was difficult and laborious—a man could pull only 40 studs a day. Using the electric Impactool, the same man removes 160 studs in a single day and still finds himself far less tired at quitting time. The prime reason, of course, is the substitution of motor for muscle. Another factor is the ability of the Impactool to exert a force on the work without transmitting any torque to the operator. B. & D. Preheat Welding has not calculated the total savings achieved by the electric Impactools on the several operations performed. Suffice it to say that on just a single operation the big 34U cuts costs $6,000 a year and has paid for itself during its first month of operation.

RAISING CANE IN FLORIDA

The U. S. Sugar Corporation Dieselized Field Operations To Process Nearly 1,000,000 Tons of Sugar Per Year

LOCATED on the shore of beautiful Lake Okeechobee in the southern tip of Florida are approximately 33,000 sun-drenched acres of sugar cane. Almost jungle-like in appearance is this vast expanse of semi-tropical verdure, stretching toward the horizon as far as the eye can see. The growing, harvesting and processing of all this cane represents an operation almost beyond comprehension, and is a story nearly as fabulous as that of Aladdin and his magic lamp.

The United States Sugar Corporation, behind all this activity, was established in 1928 and is today the largest raw cane sugar house in the continental United States. The corporation processes nearly one million tons of sugar a year, employing thousands of workmen with large fleets of various types of mechanical equipment to do the tremendous job of growing, harvesting transporting and processing.

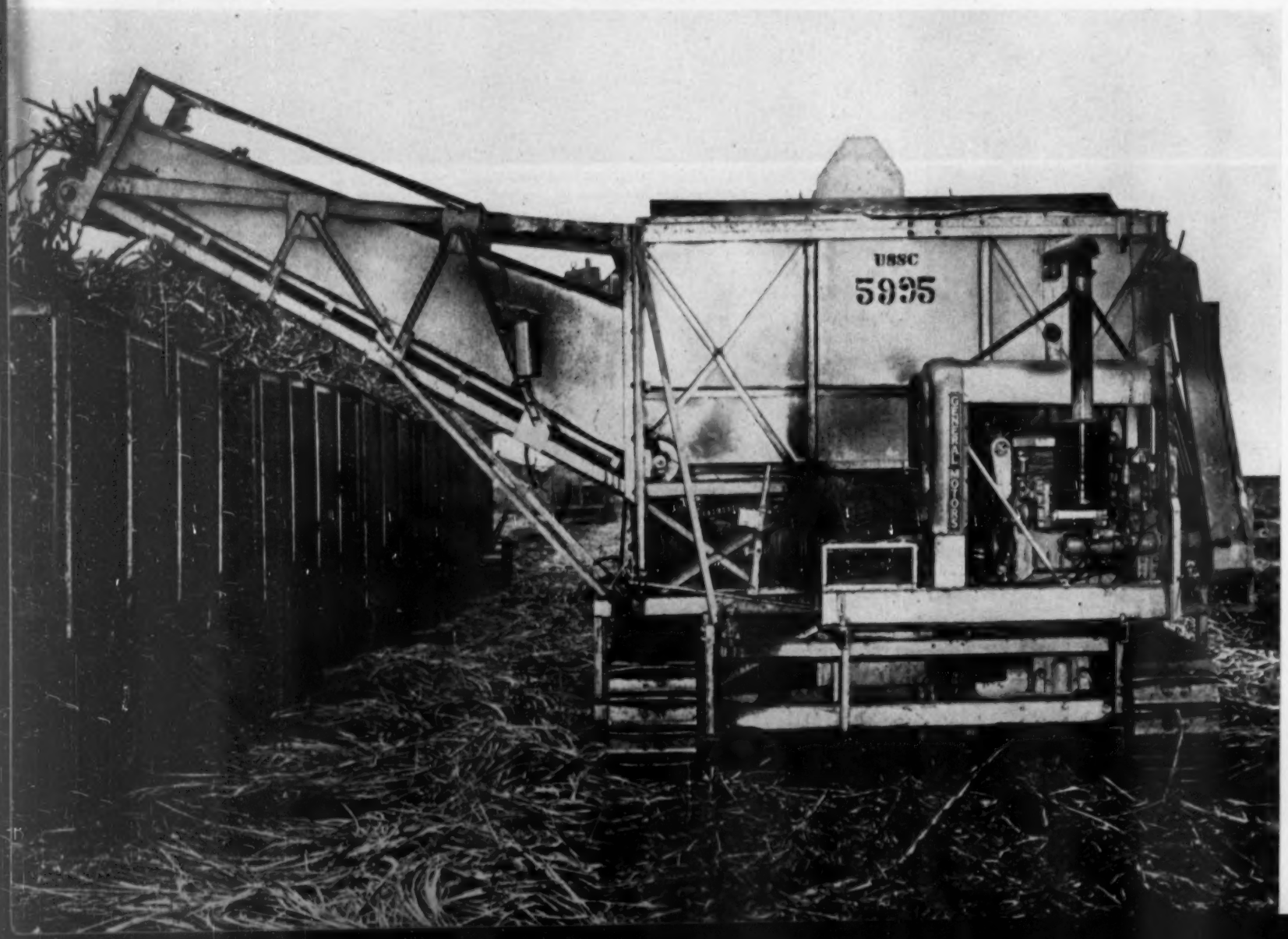
The company uses approximately 223 tractors, 600 field wagons, 450 railroad cars, 160 automotive units and maintains complete repair and manufacturing shops for each type of equipment used.

Looking across one of the main feeder canals at a lateral-ditch, we note that the rate of flow of these canals is controlled by forty-six engine pump units. These canals are necessary to enable cultivation of the muck soil. Constant drainage is maintained through an intricate system of canals. The 46 pumps which are driven by a total of 6,374 diesel horsepower, are housed in 24 pumping plants. When all pumps are working simultaneously, they have a combined capacity to move 3.3 billion gallons of water during a 24 hour period.

The harvest season usually begins about November 1st and ends about April 15th. After trained chemists have taken field samples to ascertain whether the field has the correct sugar content, the harvesting crews move in. Cutting is done by hand. Cane is piled in one row to await pickup by the continuous cane loader. This machine picks up the cut cane and loads it into field wagons for transport to standard railroad cars. The original continuous cane loader was designed and built by the United States Sugar Corporation. Current models are being built at Food Machinery Corporation's Lakeland plant but are still jointly engineered for production.

The cane loader pictured here is powered by a General Motors Series 4-71 diesel engine. Credit for introducing GM diesels to the operations of the United States Sugar Corporation is given to the Miami Branch of Florida Diesel Engine Sales Company, Detroit Diesel's Florida distributor. To date,

The original continuous cane loader designed and built by the United States Sugar Corporation. Note the GM Detroit Diesel Division Series 4-71 engine.

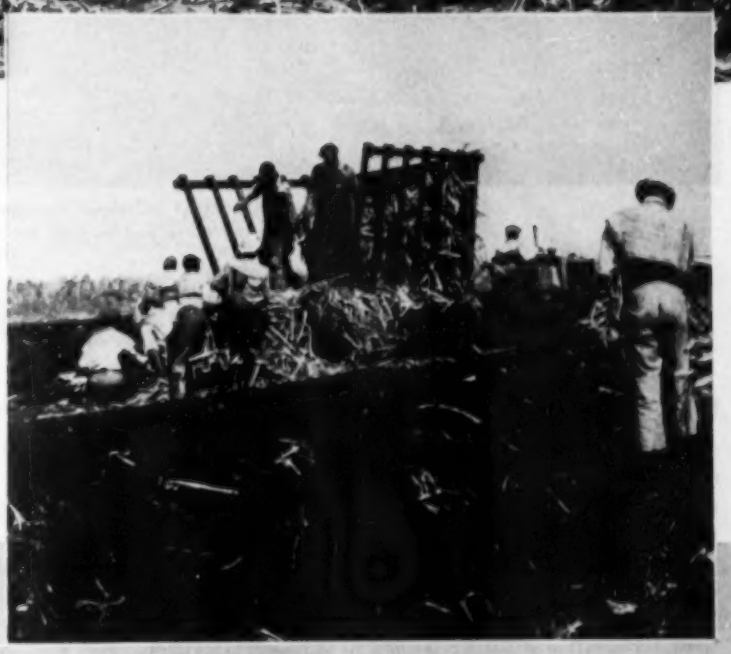


GM diesels are among those powering the Corporation's cane loaders, irrigation pumps, Allis-Chalmers tractors and Seaman tillers.

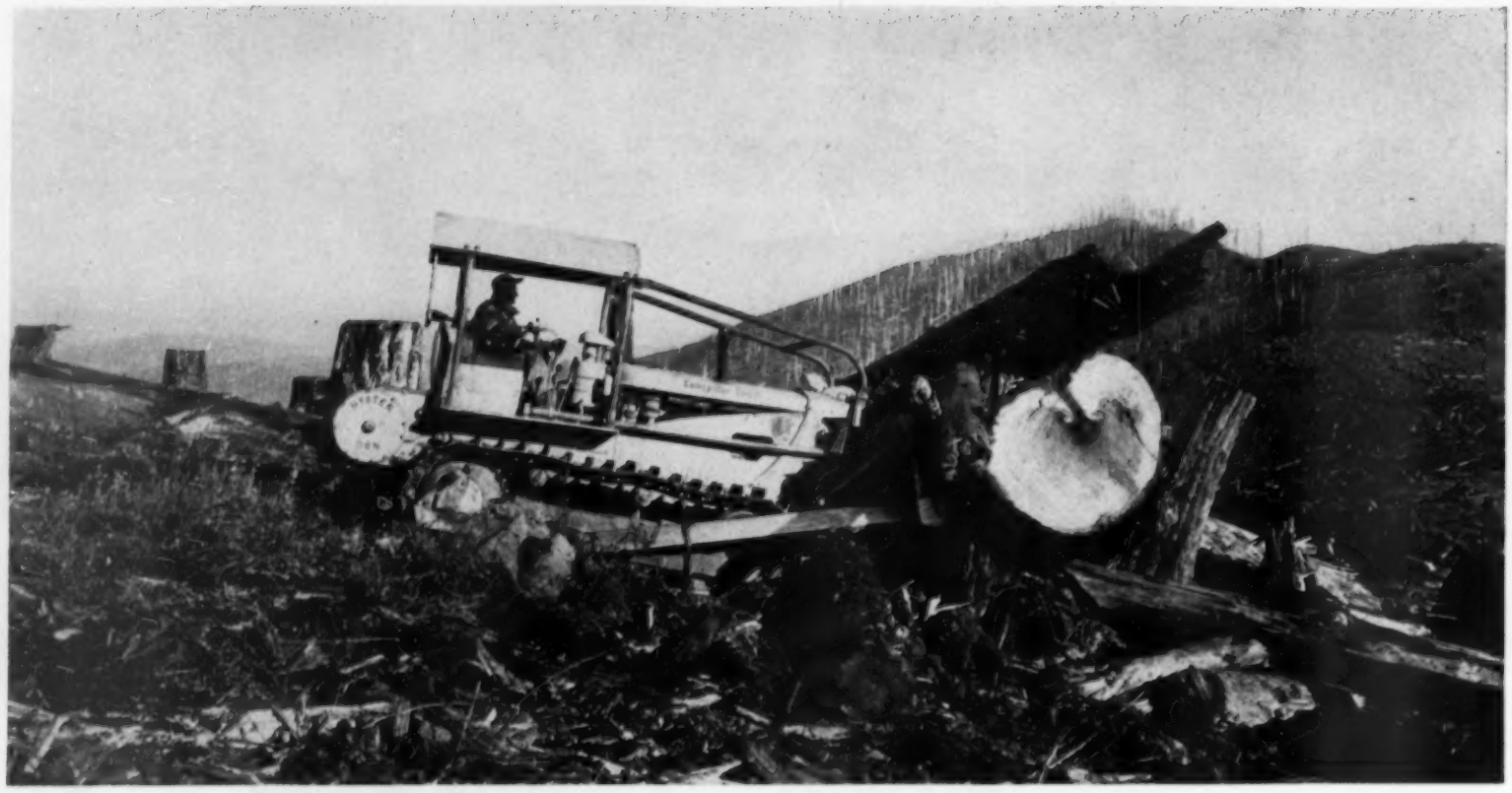
Not very long ago, sugar cane raising was almost a strictly hand process. The advent of diesels, however, has made possible the speeding of the operation and the gradual extension of the cane fields. The United States Sugar Corporation's home town of Clewiston has benefitted from this growth. It is a well-planned little resort town nestled on the shore of Lake Okeechobee right in the heart of Florida's sugar bowl and is unsurpassed for its hunting and other recreational facilities.

Rows of cut cane are scooped up by the dieselized continuous cane loader and deposited in cane wagons pulled by diesel tractors.

Planting is done by hand but the cuttings are hauled to the area by diesels.



One of the main feeder canals at a lateral ditch. Rate of flow is controlled by 46 engine pump units, a total of 6,374 diesel horsepower.



Caterpillar diesel D6 tractor equipped with No. 68 bulldozer is used for clearing center line on fire break and building access roads for fire protection. Working in forest near Tillamook, Oregon.

OPERATION FIR TREE

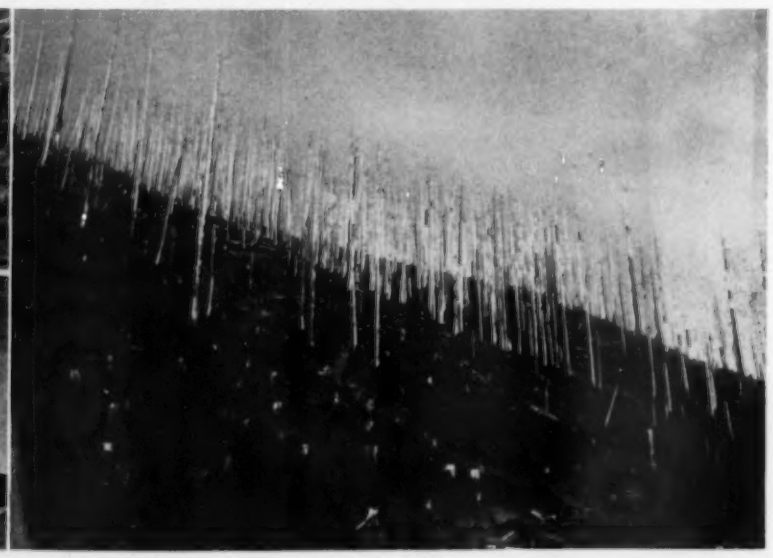
OREGON State Board of Forestry's "Operation Fir Tree," in which approximately 330,000 acres in the famous Tillamook burn area will be reforested during a 15-year program, is making steady progress. Nearly three years ago Oregon voters authorized funds to heal the scars of fire in what is said to be the largest reforestation effort ever attempted on this continent. The work involves clearing and logging off burned over sections, construction of fire breaks and roads, planting of seedlings by hand and seeding from the air. Much of the work must be done between the end of summer fire weather and start of heavy rains.

In carefully planned rehabilitation, foresters are taking no chances of history repeating itself. Construction of fire breaks, running along the tops of high ridges, and a vast network of access roads is considered one of the most important parts of the program. A block planting system is being used, whereby any new outbreak of fire may be confined to one small area, easily reached by the protection crews. This is to provide insurance against fire running wild for thousands of acres as it has done several times in the past. Fire corridors vary from 600 to 2,000 feet wide, depending on topographical conditions. Roads, designated by numerals, part the center of the breaks, following 100-foot cleared area along the middle of each break. Access roads are cut into main fire corridor arteries at strategic points. They, too, are designated by numbers. Roads will be posted with direction signs.

It is very apparent, as men and machines plug away at the task, that Operation Fir Tree will eventually become a legend in the great Pacific Northwest.

Left to right: Walter F. Sargent, rehabilitation assistant; Douglas Burbridge, tree planting foreman; Glenn French, forester in charge of tree planting; Alec Walters, tree planting foreman.

View of a portion of the several thousands of acres of burn area in forest in Oregon. Modern diesel equipment plays an important role in preventing such tragic waste of our national resources.



In this Superior Diesel Powered Barge Rig built to drill 20,000 ft. or more

Capable of drilling to depths beyond 20,000 ft., the modern integrated drilling barge, Blind Pass, represents a $1,500,000 investment in the very latest of design and construction.

Its power plant, the largest of any rig in the Gulf Coast area, boasts five 8-cylinder supercharged Superior Diesels (3350 total combined horsepower) equipped with hydraulic couplings for a fluid drive transmission.

To insure the overall working efficiency of this Diesel team, Ross Exchangers were furnished. Circulating water, lube oil and hydraulic fluid temperatures that *must* be maintained at correct level to safeguard engines and couplings — *are* maintained. *Overheating is most dependably prevented!*

Extremely rugged, pre-engineered and fully standardized, Ross Exchangers are used throughout the oil and gas industry: on diesels, compressors, turbines, hydraulic machinery, reduction gears, speed increasers.

For more information, request Bulletin 2.1K1.

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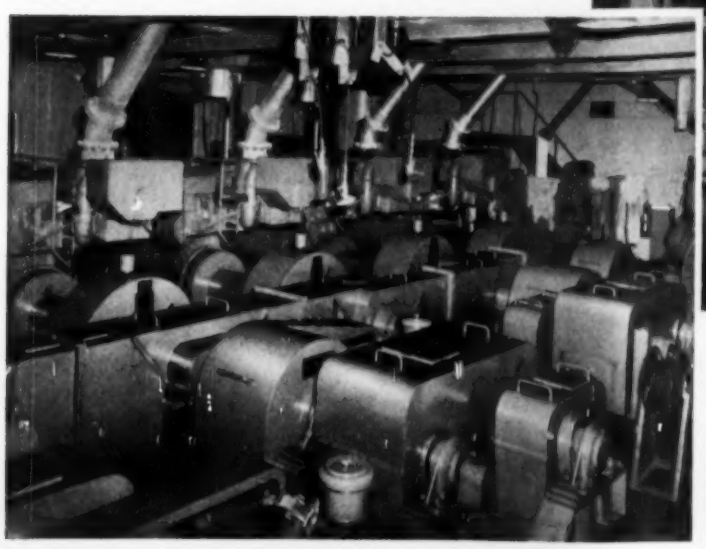

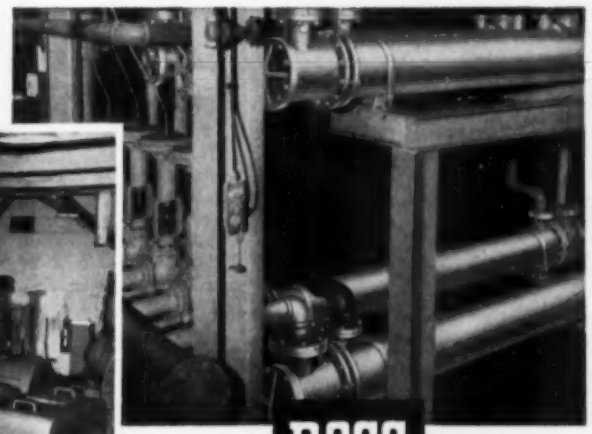

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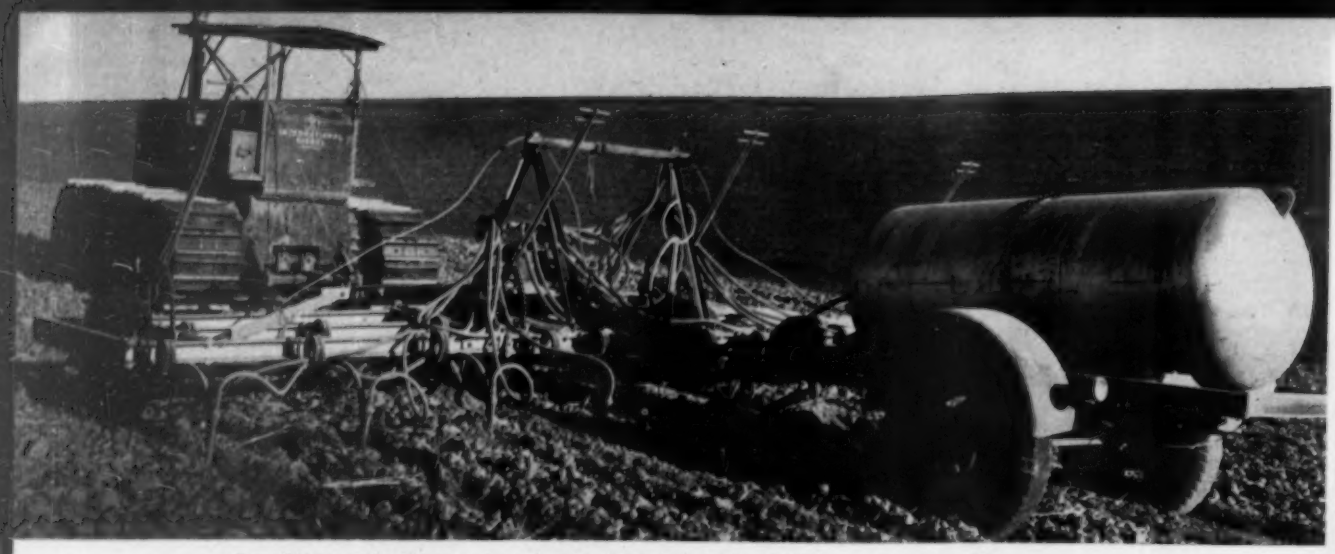


Something new in Oregon wheat farming. This International TD14A pulls a rig which meters accurate amounts of liquid nitrogen into the soil, thus fertilizing dry crop as well as irrigated fields.

OIL IN THE BOOMING NORTHWEST

Ocean, Pipe Lines, Railroads and Trucks Carry Fuels to Power Tools of Agriculture, Logging, Fishing Industries in Oilless Empire As It Burst Into Full Bloom

By F. HAL HIGGINS

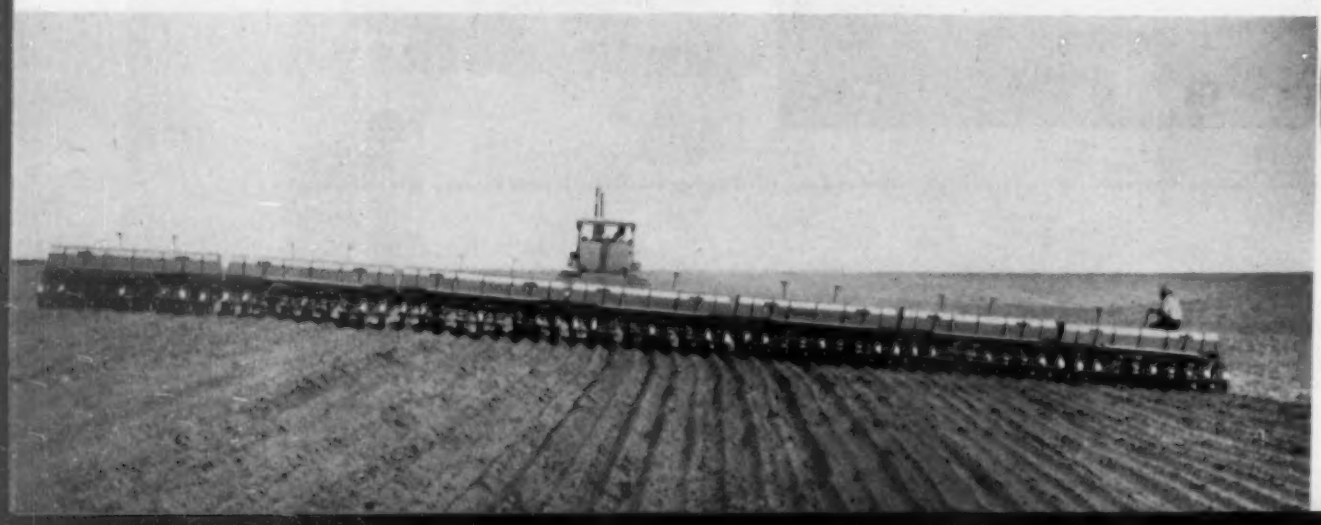
THE Pacific Northwest had burst into full bloom as an agricultural, industrial and home building empire on a scale equal to its fabulous Paul Bunyon of logging lore. Being a great area without benefit of oilfields at home, the powering and greasing of this growing giant's mechanization poses some real problems for the oil industry. That this oil industry is alive to the demands of today and the future needs of this important market is seen in the speed and efficiency with which the problems of getting the products of the refineries to logger, farmer, fisher, miner, trucker, home builder and governmental agencies is being met. The transportation, storage and distribution of the products of the "Big 7" oil companies is a high water mark of efficiency in management to match the high place it holds in exploration, research, financing and service to its customers from individual car drivers to the national Government.

The Northwest when broken down into these five distribution points—Portland, Seattle, Vancouver, Spokane and Pasco—consumes 260,000 b/d (barrels per day) of oil. The 28 counties in the Portland territory take 98,000 b/d of this with Seattle not far behind with 88,000 b/d. But by 1960, only seven years from now, the consumption will be up another 40%. The three cities of Portland, Vancouver and Seattle take 90% of the west coast demand for these states and one territory above California. The pattern demand for gas, diesel fuel, residual oil and other products ran 33%, 23%, 32% and 12% for 1949. By 1955, the trends forecast the percentages for the same classifications 34%, 25%, 29% and 12%. For 1960, it should be 37%, 26%, 25% and 12%.

The demand is being pushed up by increased populations, both via stork and internal combustion movement. This increase also steps up car population. The coming into irrigated farming of nearly a million acres in eastern Washington in the next few years will do much to balance the "wood economy" of the western side of the states of Oregon and Washington. This irrigated farming will balance, supplement and also replace some of the highly dieselized farming that has come in with big crawler tractors for wheat, field peas and alfalfa farming with large acreages in the famed Inland Empire. Much wheat land is idle in the fallow land system that makes it possible to produce a good crop every other year on rolling dry lands. Irrigated farming, whether by sprinkler or ditch irrigation from the great Grand Coulee dam system, will produce crops on all such land every year to increase use of engine-powered farm equipment and the trucks and cars that go with modern farming in irrigated districts. Natural gas pipe lines are also expected to be a competitive factor with the liquid oilfield products in the near future. It will cut down much fuel transportation by the four different avenues now well established and functioning from sea and land.

Suddenly since end of the World War II Canada has become independent on oil. The writer can recall his two editorial years at Edmonton just before World War I when there was a slight stir in the Canadian West with the discovery of the comparatively small oil fields in southern Alberta. The auto was in its earlier infancy as far as Canada was concerned. U. S. markets were far away and facilities for export were non-existent. Hence, Canadian oil 40 years ago was given little attention by Canada or the outside world as World War I opened to keep Canadian and British capital employed in producing soldiers and guns for the European conflict. Oil was seeping out of

The "inland empire" of wheat farming is highly dieselized with such outfits as this where two men seed 320 acres in 15 hours. The D8 crawler tractor is pulling 74 feet of grain drills.



A Norwegian freighter loading lumber at Coos Bay. She is powered by a Burmeister & Wain single acting, 4-stroke diesel engine.

Two dieselized bulk oil ships of Standard of California loading at the company's Long Wharf near the Richmond refinery. One is powered by a Nordberg diesel and the other by an Enterprise engine.

many spots far to the north beyond the end of steel and was mentioned as offering something for the future calculations of men with money when and if transportation and demand from the U. S. made it economical to develop the fields and haul the product a long way over rails.

"The Alberta oil strike came just in time," said one official of a leading oil company in San Francisco. "Mexico was starting to learn that the fields taken away from the American companies that had spent years and hundreds of millions of dollars developing them would not produce without good management and was starting to ask the original managers to come back and take over on a basis that was somewhat better than being locked out but not like the original deal. We were giving the idea some worried study when suddenly here was Canada with big new fields and sound government. We went north instead of south to supplement the U. S. oil fields that were being taxed to the limit to supply U. S. war and peace demands with prospects that the U. S. was soon to become an importing nation. California right now is nearing the end of discovery of new fields."

So, with the Northwest getting ready to receive Canadian oil via a new $82,000,000 pipeline that brings through a 24-inch pipe 695 miles long and lands the crude oil from the fields around Edmonton to Vancouver, British Columbia, just across the U. S. border, the drain on California will slacken. Standard, Union and Richfield are all participating in this pipe line that will be delivering 200,000 b/d by end of this year.

From Salt Lake City refinery, Standard of California has another important pipe line that brings fluid oilfield products from the excess producing fields in the inter-mountain area through a 569-mile pipe that travels over mountains, rivers and deserts to carry these refined products: stove oil, diesel oil, Chevron gasoline, alkylate, Chevron supreme gasoline. Four pump stations push the power and heat producing fluids along through the pipe with seven delivery storage plants before the eighth plant is reached at Pasco where the Snake flows into the mighty Columbia. It delivered 6½ million barrels in 1951. The important sugar beet industry, transcontinental trains pulled by diesel locomotives, fruit and sheep industries as well as mining, scattered logging and U. S. Forestry operations are all powered from this line.

The question of if and when a refinery that costs a hundred million dollars to construct becomes a good investment confronts. That Canadian pipe line with its flood of crude will demand an answer on hauling the crude down the coast for refining and hauling it back as processed products against the construction of a refinery at Seattle to process it there for distribution without the 2-way ocean haul. The water is the cheapest haul of all, though the Canadian pipe line, even with a duty on the crude coming into the U. S., becomes competitive right about at this stage. The Canadians can lower the price a bit and make it so without much argument. All the oil company top brass engineers, economists and sales men start arguing pro and con. Probably only Standard of California with one-fourth of the northwest market can afford to build a refinery soon for this Canadian crude that will come over the mountains and down to the Coast at Vancouver. And S. O. of California has already made a long range move in buying 2,000 acres twenty miles north of Seattle at a cost of $900,000. With peace instead of war, the ocean haul is a nice controlling factor in helping move a lot of bulk oil from California to the Northwest; 90% of the California oil comes by tanker. In wartime, it is so vulnerable as to be indefensible and an Achilles heel that could quickly leave the mechanized lumbering and farming industries so essential to nation and local populations limping and nearly useless from a modern defense and war effort.

So the pipe lines now ready plus a shorter one planned for early construction from Medford to Crescent City become highly important in keeping the wheels of the modern Paul Bunyan of the Northwest performing in ever increasing feats of production. Populations seem bound to keep doubling whether the national economy remains on its present high level or sags with end of the Korean fuss. It was during the dust bowl and depression years that a great migration from the Dakotas and adjacent states in the Mid-West filled the Oregon trail with family belongings lashed to their old autos as they came west to start anew. War and post-war industries speeded the movement that has not slackened. All move on oil.

Diesel tractor power spraying an orchard in the state of Oregon.

A farmer servicing his International diesel tractor for his heavy orchard and field crop work.

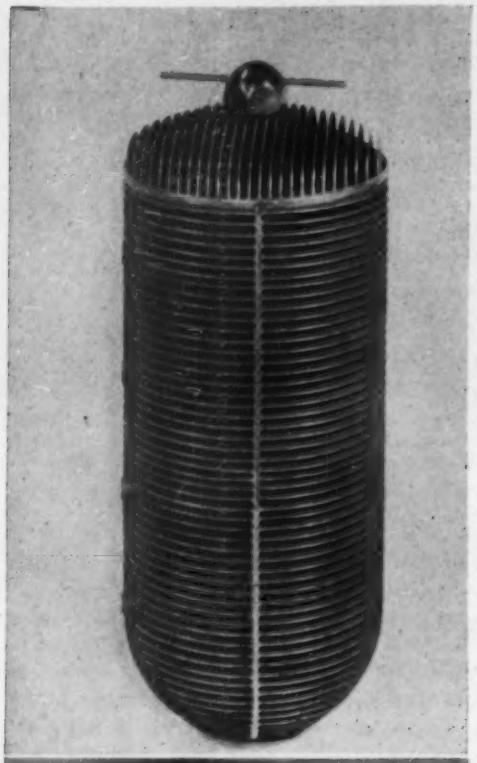
COMBINATION OIL HEAT-EXCHANGER AND CLARIFIER UNIT

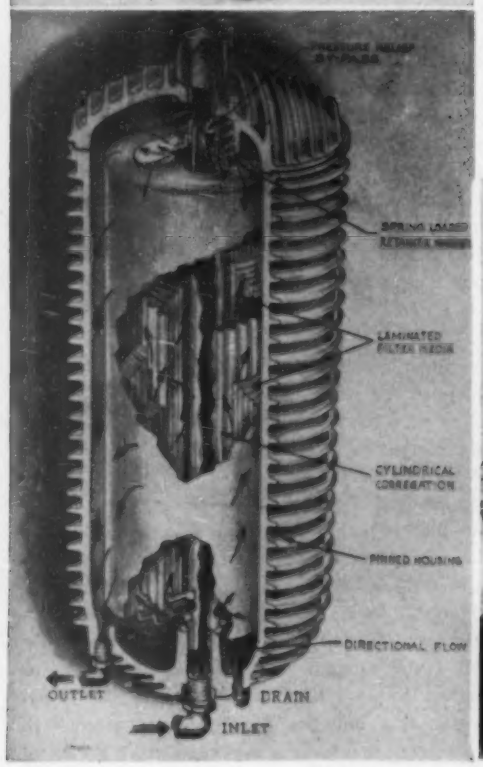
THE matter of heat dissipation when operating automotive equipment has always been a prime concern to all operators of such equipment. This is particularly true in the case of dieselized equipment. The J-B Engineering Co. announces the development of an oil heat-exchanger and an oil clarifier as a combined integral unit which, they assert, represents an advance in the method of heat dissipation resulting in lower maintenance costs and increased efficiency.

The J-B unit encompasses a replaceable filter element which, it is claimed, gives in excess of fifty percent greater service than other filters of comparable size. The element consists of a fibrous medium which will filter down to two to four microns and remove all contaminants from the oil which flows through the filter. The manufacturer states that excellent filtration is provided without any channeling and that the oil will remain at the exact specification afforded by the oil refinery. In operation, the character of the exchanger decreases the difference in temperature between the cooling system and the crank-case oil, thus narrowing the expansion between water-cooled and oil-bathed parts, such as piston skirts and the cylinder liners. The unit is equipped with a by-pass valve whereby the installation is adaptable to both full-flow and by-pass circulatory systems.

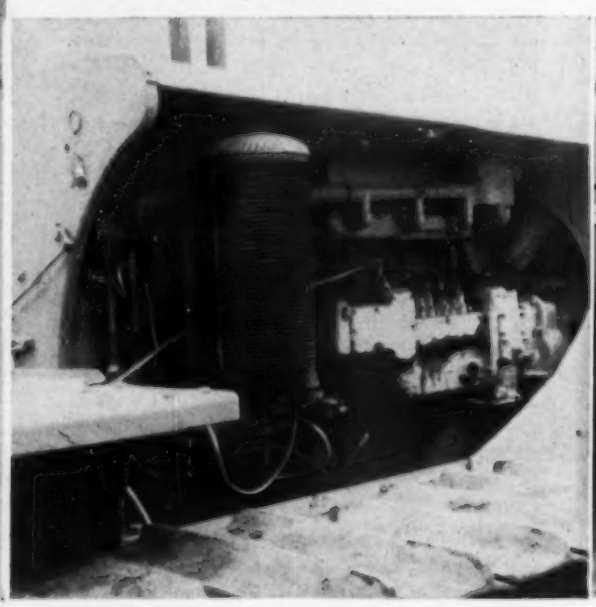
The aluminum alloy shell is especially adapted to high heat conductivity, providing over 1800 sq. in. of radiating surface. It is claimed that the unit's design reduces internal operating temperature by as much as 20 percent and fluid temperature as much as 15 percent. The length of the Model J-B 99 is 27 in. It has a diameter of 10 in. The manufacturer recommends its use on diesel, gas and dual-fuel engines in the marine, industrial, automotive, tractor and railroad fields.

For more detailed information on the J-B 99 oil heat-exchanger and clarifier unit write DIESEL PROGRESS, File 109, P.O. Box 8458, Cole Station, Los Angeles 46, California.





Cutaway view of the J-B 99 Combination oil heat-exchanger and clarifier.



A J-B 99 installation on a Cat D-8 owned by John H. Pankratz, North Hollywood contractor.

The combination unit mounted on a GMC truck powered by a Detroit Diesel Model 6-71 engine.

Comparison Operating Data—Certain REA-Financed Internal Combustion Generating Plants
June 1953

Plant No.	Size kw.	Gross Generation M KWH	Sta. Ser. %	Plant Factor %	R P C Factor %	Fuel-Cost Oil ¢/gal.	Fuel-Cost Gas ¢/MCF	BTU per KWH	HP/Hrs. per Gal. Lube	Man-hrs. Oper.	Man-hrs. Maint.	Maint. Mat. $	Production Costs Mills/Net KWH Labor	Fuel	Others	Total	BEST OF THE MONTH BTU/KWH
3A	2,065	417.6	7.2	54.7	99.0	13.50	10.68	9927	4,589	735	110	1291.89	4.21	2.16	4.26	10.63	9957
7B.	4,600	1,194.0	3.3	36.2	64.0	11.10	.....	9863	7,227	887	12	88.49	1.04	8.20	.54	9.78	9863
11.	3,755	270.1	6.2	10.3	85.8	10.46	.....	9800	4,730	469	33	.....	4.54	7.56	.64	12.74	9800
17B.	3,939	1,208.8	2.7	42.6	62.8	9.62	.....	9776	7,314	840	244	174.89	1.85	7.01	.40	9.26	9776
19B.	4,086	488.6	3.6	13.8	78.7	8.70	.....	9319	3,042	899	20	221.18	4.25	6.06	1.24	11.55	9319

EARLY 19TH CENTURY SAWMILL IN EAST TOPSHAM, VERMONT

Industrial Giant?

No, Duncan Miller, Vermont logger (pictured left), is no industrial giant, but his power and lubrication needs are just as vital, and served just as assiduously by Cities Service. Cities Service is proud of its long and successful record serving America's top industrial organizations, but it is equally proud of its record with the "Duncan Millers."

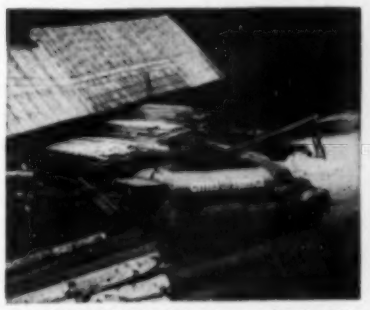
Says Duncan Miller: "I produce some 600,000 board feet of lumber a year. My 100-horse diesel drives all my equipment. I use Cities Service Diesel Fuel because it gives me all the power I need and burns so cleanly to provide easier equipment maintenance.

"In my trucks, tractors, chain saw and sawmill, I use Triple HD Koolmotor Oil. I even use Koolmotor in my high speed bearings that carry heavy loads . . . and Koolmotor has done every job with complete satisfaction for me.

"I also use Cities Service Gasolene in my trucks, tractors and chain saw. I heartily recommend it where a lot of power and economy of operation are needed."

You don't have to be a sawmill operator to realize the value of Cities Service one-source buying for the finest, most economical power and lubrication, and the services of our expert Lubrication Engineers!

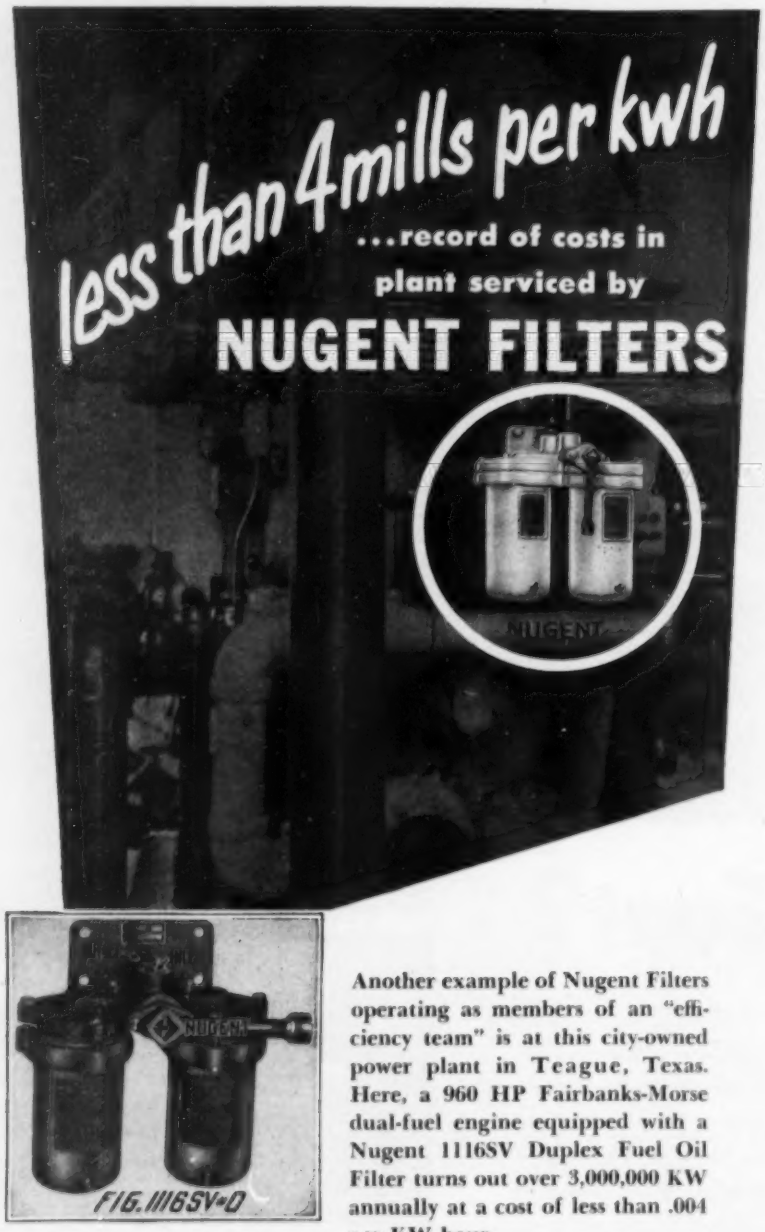
100-HORSE DIESEL, powered and lubricated with Cities Service Products, is the power plant for Miller's operation.



FOR SEVEN YEARS, Miller has used only Cities Service Products and *"They have given best results at all times."*

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Nugent 1116SV Duplex Fuel filter of the type installed at the power plant in Teague, Texas.

Another example of Nugent Filters operating as members of an "efficiency team" is at this city-owned power plant in Teague, Texas. Here, a 960 HP Fairbanks-Morse dual-fuel engine equipped with a Nugent 1116SV Duplex Fuel Oil Filter turns out over 3,000,000 KW annually at a cost of less than .004 per KW hour.

Nugent fuel oil filtering of this type, by actual test, removes 99.8% of harmful impurities—particles as small as a few microns that might otherwise block the fuel injector or accelerate wear.

Whatever your filtering requirements—fuel, lube oil or coolants—there's always a Nugent filter available . . . at low cost . . . of proper size and type. Write for full details on how Nugent filters can improve the efficiency of your operations . . . why it is factory installed on so many leading diesel engines.

Wm. W. Nugent & Co., Inc.
415 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Established 1897

Young Radiator Plant Expansion Program

Inaugurating a new plant expansion program at Mattoon, Illinois, Young Radiator Co president F. M. Young (left) hands Francis Farrier, contractor, a sealed copper envelope containing data on the company.

A new industrial expansion program is underway at the Mattoon, Illinois, plant of the Young Radiator Company. Home offices and main plant of the heat transfer concern are located in Racine, Wis. Construction began with ground breaking ceremonies conducted late in June of this year, in which Young Radiator Company president F. M. Young participated.

The new construction involves 20,000 square foot, one-floor structure adjoining parent buildings in Mattoon. All manufacturing facilities of the Young Radiator Company, including the new addition, engage in the design and production of heat transfer units. These products are engineered for automotive and industrial applications, as well as heating, cooling and air conditioning products for home and industry.

Named Director Sales Development

Albert G. Crockett

Albert G. Crockett, Mack Truck executive, has been appointed director of the company's newly-formed Sales Development Division. Announcement was made by E. G. Ewell, vice-president and general sales manager. In his new capacity Mr. Crockett will coordinate the functions of Public Relations, Advertising, Sales Promotion and Sales Training. He was formerly special assistant to the executive vice-president and manager of public relations. He has played a leading part in Mack's public relations campaign in behalf of truckers and the trucking industry. A nationally-known speaker and recognized authority on transportation subjects, Mr. Crockett became particularly well-known for his early wartime "Keep 'Em Rolling" national tours, sponsored by Mack in cooperation with O.D.T. and the late Joseph B. Eastman.

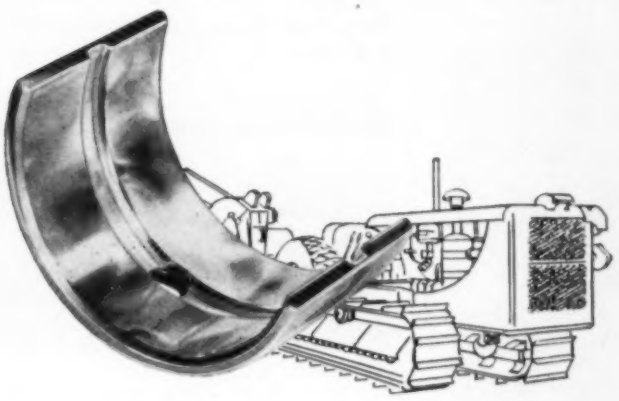
YOUR COPY OF DIESEL ENGINE CATALOG in its eighteenth completely re-edited, revised and expanded edition is now off the press. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this latest edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

Diesel Manufacturers Report Longer Life From Solid Bearings Of Alcoa Aluminum!

Four of America's leading diesel engine manufacturers switched to solid bearings of Alcoa® Aluminum . . . *and each reports increased bearing life* as a result!

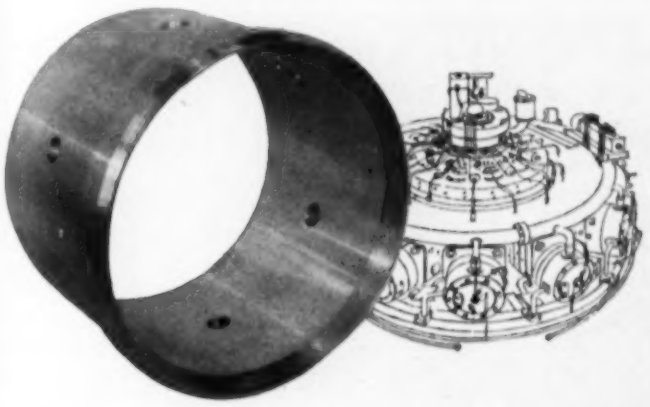
Aluminum bearings last longer because they move heat fast . . . eliminate hot spots. Because they're solid bearing metal, there's no hard backing to score expensive shafts—cause costly down time.

Alcoa Aluminum Bearings have proved their amazing ability to carry heavy loads, resist corrosion and cut friction loss in thousands of operating hours. Here are four examples of how aluminum bearings, finished and supplied by leading manufacturers, increased the service life of some of the country's finest diesel engines. Aluminum Company of America, 1987-K Alcoa Building, Pittsburgh 19, Pa.



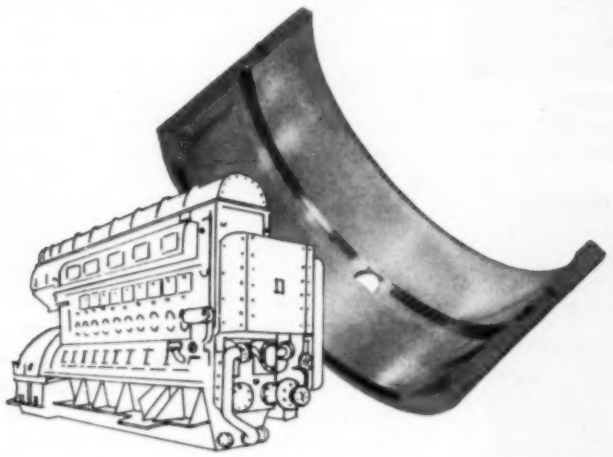
CATERPILLAR TRACTOR COMPANY strives continually for product betterment. Desiring longer bearing life, they converted the main, connecting rod and thrust bearings in their tractor to cast Alcoa Aluminum Alloy.

In addition to *longer life*, the solid aluminum bearings also showed a much lower percentage of failures compared with previously used bearings on the same application.



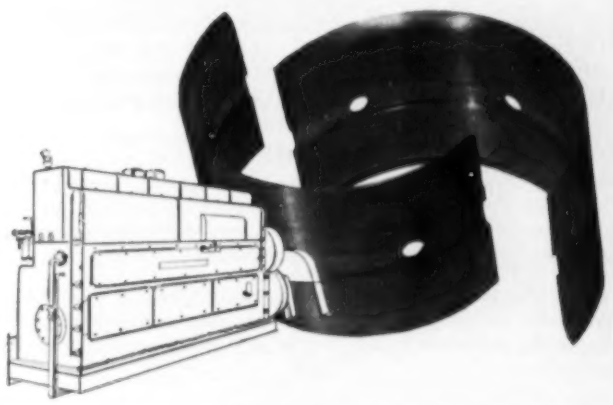
The **NORDBERG RADIAL ENGINE** is a forward step in gas and oil engine design. Previously used babbitt bearings were replaced by full round, solid bushings of Alcoa Aluminum.

The aluminum bushings proved far superior, giving longer bearing life with minimum maintenance. Over 20,000 operating hours have been achieved without interruption from bearing trouble!



FAIRBANKS-MORSE switched from steel-backed or bronze-backed babbitt to solid Alcoa Aluminum for the crankshaft bearings of their 8¼ x 10 Opposed Piston Diesel Engine.

At present, the aluminum bearings are giving at least 10 times the life of previous bearings . . . with the added advantages of freedom from shaft damage, resistance to corrosion, reduced rotating weight and a reduction of maintenance costs!



INGERSOLL-RAND specified long-lasting Alcoa Aluminum Alloy Bearings in their Type "S" (Diesel) Oil Engine . . . main, connecting rod and thrust bearings . . . *all full-floating!*

The results were—longer life, lower cost than steel-backed babbitt, no fatigue failures, no spoilage of crankshafts from bearing seizures . . . and no bonding to give way and cause premature failure!

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

Executive Vice-President

J. A. Cameron

Mr. J. A. Cameron has been appointed executive vice-president and assistant general manager of The Marley Company, major manufacturer of water cooling towers and other cooling equipment for industry and air conditioning. Mr. Cameron has been with The Marley Company since 1937, at which time he served as a sales engineer in their New York office. In 1939, he was promoted to New York sales manager, and within a short time was elevated to eastern regional manager, in which position he has served until his recent appointment. In 1944, he was made vice-president board of directors. He received his bachelor of science degree in mechanical engineering from Pennsylvania State College. Prior to joining The Marley Company, he was a sales representative with the Ingersoll-Rand Company in New York.

Publishes Profits Plan Book

To help dealer service departments and independent service stations to increase their sales of carbon-blast tune-up service is the purpose of elaborate Profits Plan Book just published by the Kent-Moore Organization, Inc., Detroit, a leading manufacturer of special locomotive service tools and equipment. Profusely illustrated and handsomely printed in two colors, the book is available without cost to dealers and service stations already having "Head-On" carbon blast equipment, as well as to others interested in availing themselves of this customer service, whose popularity with the motoring public has been rapidly expanding.

The dealer merchandising program that it features includes virtually every type of tie-in advertising, from mailing cards an dstickers to radio transcriptions and service-department posters, and constitutes one of the most comprehensive campaigns on specific service items ever to be offered to dealers. Copies are available from Kent-Moore Organization, Inc., 5-105 General Motors Building, Detroit 2, Michigan.

Diesel-Electric Switchers Cut Costs

Replacing its old steam locomotives with diesel-electric units has produced a considerable saving in railroad operating costs for the Sharon Steel Corporation. The eight locomotives, Baldwin-Westinghouse switchers, are used to transport hot-metal from blast furnace to open hearths, haul and dump slag, spot coke and ore cars, and many other switching operations required around a steel plant. Availability is a highly important factor in work of this kind, because even the slightest delay may mean a heavy loss in production where time is a critical factor. The new locomotives are ready to go at the push of a button and incur no extra daily costs for hostling, fire cleaning, coal loading, steam charging, etc., as with the different types of steam locomotives. The diesel-electrics need refueling and resanding only every three days.

Furthermore, the fuel weight is on the locomotive where it helps to increase tractive effort. At the Roemer Works they are able to haul 50% greater loads, especially up the steep grades of trestle inclines. Another feature of the Baldwin-Westinghouse units is their ability to furnish quickly the large volume of compressed air needed to dump cars of ore, coke, etc. Aside from reducing operating costs, the diesel-electrics have eliminated the complaint of smoking up the atmosphere, which is common with coal fired locomotives, when they must enter plant buildings. The absence of smoke has also contributed to the company's purification program. Many safety features were incorporated into the Sharon Steel locomotives: Each one is equipped with dual control so the engineer may operate from either side of the cab. This gives him greater visibility and permits him to move to the track side having the most or more-serious operating hazards. The cabs are heated, clean and comfortable, and contain all the necessary safety and signal equipment needed to operate in highly congested and populated areas of industrial plants.

NO MATTER HOW BIG THE DIESEL JOB
MAY BE, OR WHAT THE DEMANDS - - -
BIG OPERATORS SPECIFY
Briggs
PIONEERS IN MODERN OIL FILTRATION
MISSISSIPPI VALLEY BARGE LINE CO

3200 H.P. DIESEL TOWBOAT, W. S. RHEA
Owned by Mississippi Valley Barge Line Co.
Port engine showing part of the Briggs installation.

AND WITH GOOD REASON

Briggs Oil Filters are a part of some of the world's largest diesel installations . . . Marine, Railroad and Industrial. The accounts we serve are long time users because they find that genuine all-around Briggs economy outbids and out-performs all other types of oil filtration.

Above is just one of the many Briggs equipped towboats operated by Mississippi Valley Barge Line Co. Engine performance and long run, lasting economy are the yardsticks by which efficiency of their power plants are judged.

WHAT DOES THE RHEA USE?

Among other Briggs filters, they use the Briggs A-414 filter cartridge. It has more dirt holding and trapping capacity than any other cartridge of its type. The many patented Briggs features bring high flow rate . . . low pressure drop, and peak holding capacity right where you want them. We will be glad to send you one for trial, at no cost to you. Write today.

Briggs A-414
- High dirt capacity
- High flow rate
- Exclusive Briggs disc-pac cellulose

Briggs OIL FILTERS
PIONEERS IN MODERN OIL FILTRATION

FOR OVER A QUARTER OF A CENTURY

THE BRIGGS FILTRATION COMPANY, RIVER ROAD, WASHINGTON 16, D.C.

Load Regulator for Diesel-Electrics

An improved load control regulator for diesel-electric locomotives is available from Westinghouse Electric Corporation. The new Commustat regulator automatically insures constant loading of the diesel engine over the normal range of operating speeds and matches the output of the generator to the power the engine can produce. The Commustat employs a hydraulic cylinder, the piston of which is linked to a brush arm that rotates about a stationary commutator. Individual bars of the commutator are connected to tapped resistor tubes. The position of the hydraulic cylinder determines the value of resistance in the exciter battery field. A pilot valve mounted on the diesel engine governor and operated by the governor fuel-control arm controls the flow of oil to and from the load regulator cylinder.

Load regulators for passenger or all-service locomotives are equipped with an air actuator to provide a "soft start". The new regulator utilizes tapped vitreous-enameled resistor tubes. Resistance of these tubes remains constant and is not affected by dirt or vibration. An improved pilot valve requires only routine adjustment, and maintenance. The metering valve used on the superseded carbonstat regulator and earlier models of the Commustat has been eliminated.

The new regulator is suitable for replacing existing carbonstat regulators and kits are available from Westinghouse for modernizing earlier models of the Commustat regulator. For further information, write Westinghouse Electric Corporation, Box 2099, Pittsburgh 30, Pa.

Tight Squeeze

When an ordinance in Seattle, Washington, limited sidewalk openings to six feet by twelve feet, riggers with the job of installing this large Cooper-Bessemer diesel literally had to put the "square peg through a round hole." Only by standing the 18-ton diesel engine on end was it possible to lower the heavy unit clearing the opening by inches. The Cooper-Bessemer diesel-electric generating set is a standby power unit installed by the Pacific Telephone and Telegraph Building in Seattle, Washington. The independent electric generating unit starts up automatically to keep telephone and telegraph services going in the event of power failure for any reason.

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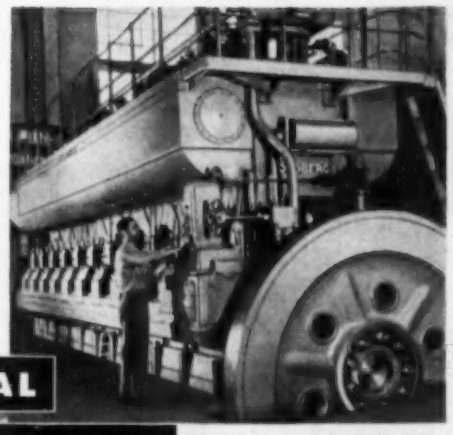
In Texas



Greenville, Texas

MUNICIPAL PLANTS

Denton, Texas

as Elsewhere

DIAMOND CHAIN DRIVES

Perform Dependably on

NORDBERG ENGINES!

At the Denton and Greenville, Texas, municipal power plants, as elsewhere, Nordberg Engines with dependable Diamond Roller Chain Drives provide long years of economical, trouble-free service. Triple 434 Chain drives the main engine lubricating oil pump, Diamond 66 drives the engine actuator oil circulating pump.

In the Diesel fuel oil, gas and dual-fuel engine field, Diamond Roller Chains have demonstrated their long lasting uniform quality, reserve strength, quietness and smoothness of operation, and high maintained efficiency . . . Since the drive is positive, there is no slip—no deviation in speed ratio.

Practical recommendations on roller chain timing and pump drive applications will help save your time. Such assistance is yours for the asking.

Chains shown one-half actual size.

Both Single and Triple-Strand Diamond Roller Chain Drives are used on the Nordberg Engines shown above.

SHOT-PEENING SINCE 1944

Diamond Chain has long recognized that certain types of internal stressing of chain parts would increase fatigue resistance. To this end, link plates have been specially processed and chain rollers and other parts have been shot-peened since 1944.

DIAMOND CHAIN COMPANY, INC.

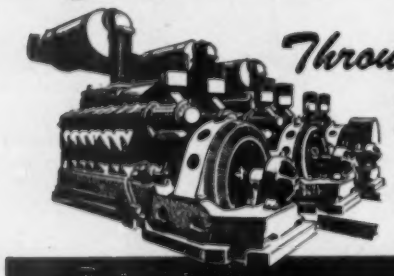
Where High Quality Has Been Traditional Since 1890

Dept. 407, 402 Kentucky Ave., Indianapolis 7, Ind.

DIAMOND ROLLER CHAINS

There is a competent Aerofin heat-transfer engineer near you—qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem—and backed by the research and production facilities of the pioneers in light-weight extended surface.

Ask the Aerofin Man.



Throughout the Power Industry—

Aerofin units do the job Better, Faster, Cheaper

AEROFIN CORPORATION 410 South Geddes St. Syracuse 1, N. Y.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

Assistant Managers

E. A. Humble

M. C. Seeman

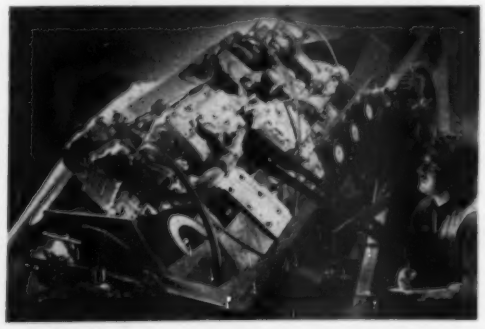
O. M. Sievert

Three assistant managers have been appointed by the Elliott Company, Jeannette, Pa. They are E. A. Humble in their Boston office, M. C. Seeman in their Cleveland office, and O. M. Sievert in their Kansas City office. Mr. Humble started with Elliott in 1925 after graduating from Oregon State University as a mechanical engineer. He has been a field engineer in the Cincinnati, Washington and Boston offices, and was assistant to the general sales manager in Jeannette between 1941 and 1944.

Mr. Seeman attended Carnegie Institute of Technology and Yale University and graduated as an electrical and mechanical engineer in 1947, after serving as a lieutenant (jg) in the navy from 1943 to 1946. He joined Elliott in 1947 and was assigned to the heater division and in 1948 became a field engineer in the Cleveland offiffice.

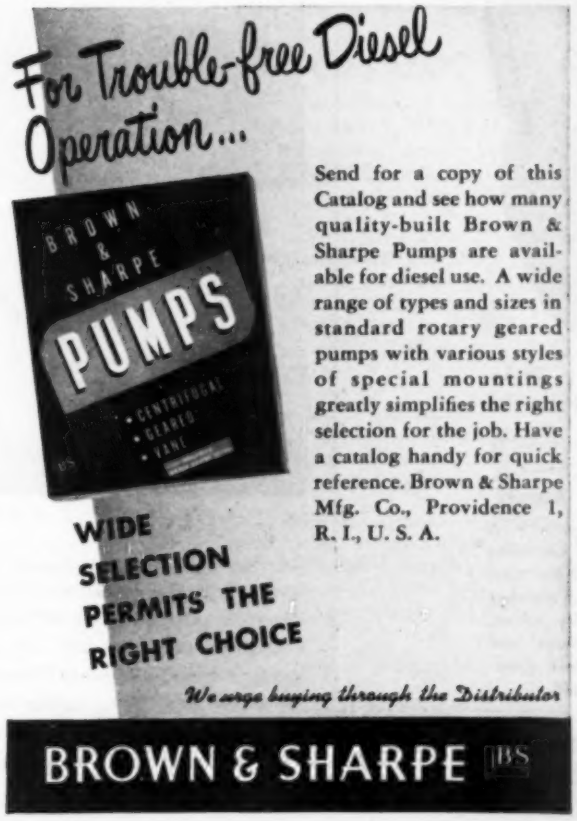
Mr. Sievert joined the company in 1944 after graduating from the Misouri School of Mines as a mechanical engineer. After serving two years in the Navy he returned and was assigned to the Cincinnati office as a field engineer in 1947 and to the Kansas City office on January 1, 1953.

"Tilt-Test" Stand



A "tilt-test" stand in the engineering laboratories of the Detroit Diesel Engine Division of General Motors is used to check the performance of an engine while tilted to various off-vertical positions. Here an attendant checks oil gauges to determine the effectiveness of the lubrication system at an extreme angle. These tests preclude lubrication difficulties which might arise in engine because of off-level operation in tractors and other earth moving equipment. The tests have also helped in Detroit Diesel's development of inclined engines used in rail car and marine propulsion engines.

FOR MORE SERVICE YEARS
Atlantic Flexible Metal Hose
JUNE
• For VIBRATION DAMPENING
CORRECTING MISALIGNMENTS
EXPANSION, CONTRACTION
of Diesel Exhausts, Air, Fuel Lines
• For VENTILATING HOLDS
• For LOADING & UNLOADING
Oils, Molten Chemicals, Refrigerants,
Light or semi-solids
SEAMLESS OR INTERLOCKING CONSTRUCTION
BRONZE, STEEL, STAINLESS STEEL—⅛"-36" I.D.
with fittings as needed.
Write for Bulletin 1020.
See our Catalog in Sweet's File
for Product Designers and
Mechanical Industries.
ATLANTIC METAL HOSE CO., INC.
102 West 64th St., New York 23, N. Y.


For Trouble-free Diesel Operation...
BROWN & SHARPE
PUMPS
• CENTRIFUGAL
• GEARED
• VANE
Send for a copy of this Catalog and see how many quality-built Brown & Sharpe Pumps are available for diesel use. A wide range of types and sizes in standard rotary geared pumps with various styles of special mountings greatly simplifies the right selection for the job. Have a catalog handy for quick reference. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.
WIDE SELECTION PERMITS THE RIGHT CHOICE
We urge buying through the Distributor
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Wherever your diesel operates . . . FRAM lube and fuel oil filters are your best assurance of *dependable* power year after year.

FRAM Filters guard your engine against power robbing sludge, dirt and dust . . . filter out harmful particles as small as .000039".

A FRAM lube filter cleans oil faster, cleaner and keeps it clean longer than any ordinary filter. Bearings, liners, rings and other vital engine parts wear longer . . . reducing costly down-time and maintenance.

FRAM fuel filters keep your diesels operating at top efficiency with clean, even fuel injection . . . protect precision fuel injectors against abrasion and excessive wear.

Thousands of FRAM installations have proved that superior FRAM protection pays for itself in lower operating costs, increased time between overhauls and less oil consumption.

FRAM Filcron
THE MODERN OIL FILTER
Solve your filtering problem with FRAM
Whether your filter problem is lube or fuel, FRAM Filters offer you the most efficient and profitable solution. Let FRAM engineers prove it . . . write today to: FRAM CORPORATION, Providence 16, R.I. *In Canada:* Fram Canada Ltd., Stratford, Ontario.

Micro-Klean Bulletin

A new bulletin describing its full line of Micro-Klean Filters (for liquid applications) has just been published by the Cuno Engineering Corporation, Meriden, Connecticut. The products described include standard models for flows between 1.8 gpm. and 900 gpm. Maximum operating pressures of standard units range from 125 psi. to 1000 psi. Higher operating pressures available upon request. Featured in the bulletin is the recently announced graded density cartridge. Applications, standard dimensions, case histories, and a selector chart, to be used as a guide for choosing the proper filter under normal conditions, are included. Of special interest to engineers is a full page of hydraulic data covering such items as viscosity conversion tables, hydraulic formulae, dimensional comparisons (mesh, inches and micronic) and representative micronic comparisons. The twelve page bulletin, No. MK-0553, is available from the Cuno Engineering Corporation, Meriden, Connecticut.

New Utility Heater Catalog

A handy, 4-page, 2 color Young Radiator Company catalog, describing its new line of Utility Heaters, is just off the press. Fully illustrated, the Utility Heaters featured are designed for use in mobile units and small space heating requirements. Mobile unit models are available with or without defroster equipment. For complete feature, capacity and design information, write Young Radiator Company, Racin, Wis., requesting free Young Utility Heater Catalog No. 6253.

Motive Power Consultant

A. H. Candee

Appointment of A. H. Candee as Motive Power Consultant has been announced by F. H. Kilberry, general manager, Engine Division, The National Supply Co. Mr. Candee has been with Westinghouse Electric Corp. from 1910 until his retirement in March of this year. He will advise on applications of National Supply's locomotive diesels in additional areas of use. The author of many papers for engineering societies, railroad clubs, colleges and the technical press, Mr. Candee had considerable influence in the shaping of the diesel electric locomotive from its inception to its present form. A member of the American Soicety of Mechanical Engineers, the American Institute of Electrical Engineers, the Locomotive Maintenance Officers Association, and the Southern & Southwestern Railroad Club, Mr. Candee during his career has had 75 patents granted or pending, all concerned with his work in the motive power field. He will make his headquarters at 2327 Grant Bldg., in Pittsburgh. The company's engine plant is at Springfield, Ohio.

Opens Two New Branch Offices

Percy E. Griffin — Hugh Goodwin

S. F. Atsatt — H. T. Anderson

Returning from a sales exploration trip, Paul I. Birchard, vice president and general manager of Enterprise Division, General Metals Corporation, announced two new sales and service offices to handle engine business. In Denver and the Rocky Mountain area, Percy Griffin heads up the new office. The complete line of engines will be his charge with special emphasis on oil field applications. In Minneapolis Stewart F. Atsatt will set up a complete sales and service outlet for the Enterprise line of diesel engines. Hugh Goodwin becomes manager of the New York Enterprise branch office, as H. T. Anderson returns to San Francisco as assistant general sales manager under vice president Birchard.

CLUTCHES by ROCKFORD

Easy Handling on Curves and Around Tight Corners

This J. I. CASE INDUSTRIAL TRACTOR, equipped with a shoveloader, sets pipelines and backfills after sections are tested and sealed. ROCKFORD CLUTCHES help this rugged unit maneuver handily in close quarters. Let ROCKFORD clutch engineers help *your* product designers plan versatile power transmission controls for your machines.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

B-W

ROCKFORD CLUTCH DIVISION BORG-WARNER

1321 Eighteenth Avenue, Rockford, Illinois, U. S. A.

PIERCE

CENTRIFUGAL governors give you exact R.P.M. control ... at LOWER COST

For more than 40 years Pierce has specialized in the speed control field. Pierce *Centrifugal* Governors, engineered specifically for your Diesels, give accurate, dependable control of engine RPM to meet the varying conditions of any job. Pierce Governors are standard equipment on many of America's finest diesel engines . . . assuring maximum protection, dependable performance—at lower initial and maintenance cost. Replacement governors and parts are available through your local distributor or fuel injection service station.

For distributor's name or information on special governing problems, write

the PIERCE GOVERNOR CO., Inc.

1612 Ohio Avenue, Andersen, Indiana

"WORLD'S MOST EXPERIENCED GOVERNOR MANUFACTURER"

A WIRKKALA PROPELLER

. . . drives the ocean troller HARVEST QUEEN. Captain Wally Leback reports great improvement with a WIRKKALA PROPELLER.

●

Captain Wally Leback, after the first trip out with the new wheel on the HARVEST QUEEN, reports: "There has been a great improvement in overall performance—more speed at cruising RPM . . . the engine will idle down to 300 RPM with no gear lash or vibration . . . also silent propeller performance at all speeds."

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Salmon are allergic to excessive propeller noise and vibration.

HARVEST QUEEN, 46 ft. troller built by Ilwaco Boat Works and powered with a 6-71 GM Diesel with a 3:1 reduction gear, and 40 x 24 in. WIRKKALA propeller.

WIRKKALA PROPELLERS WILL INCREASE YOUR PROFIT MARGIN BY DECREASING YOUR OPERATING COSTS

Invented by Mr. Oscar Wirkkala and tested under the severest operating conditions, this new WIRKKALA propeller has proved itself the most advanced propeller in use today. Protected by world patents.

Phone, Wire or Write TODAY for the FACTS

WIRKKALA PROPELLER SALES, INC.

Naselle, Washington — Phone: Naselle 541

DIESEL ENGINE CATALOG

The purpose of this little advertisement is to tell you about Volume 18 of DIESEL ENGINE CATALOG which is now available, entirely revised and rewritten. This is the 18th edition of the book that has earned the name of "the bible of the industry."

All smart diesel engine salesmen carry this book around in their car. When they run into some new competition with which they are not too familiar, the DIESEL ENGINE CATALOG gives them full, accurate information when they need it most.

The consulting engineer keeps this book in his reference file. It immediately gives him *all* data on diesel engines coming within a given horsepower range, speed range and weight range.

People who sell, people who buy, people who use diesel engines need this new, fully illustrated, up-to-the-minute volume. It has been completely revised and expanded. Orders are now being accepted for this latest edition. Price $10.00 prepaid.

Add California Sales Tax for Delivery in That State

DIESEL PROGRESS

816 N. LA CIENEGA BLVD.

LOS ANGELES 46, CALIFORNIA

Bulletin

Typical applications and operating characteristics of Chromalox electric circulation heaters are featured in a new 8-page bulletin by Edwin L. Wiegand Company. The folder explains how the automatic circulation heaters give efficient, automatically controlled heating of water, steam, oil, heat transfer media, air and other gases for industrial processes. Chromalox Circulation Heaters are packaged units complete with built-in elements, heating chamber, thermostat, insulation and mounting lugs. They arrive ready to attach to pipe lines leading to oil tanks, processing kettles, revolving rolls, water storage tanks, etc. Photos and drawings show methods of installation and advantages of the packaged units for a wide variety of installations. For a copy of Bulletin 701 write to Edwin L. Wiegand Co., 7666 Thomas Blvd., Pittsburgh 8, Pa.

Western Regional Sales Manager

The appointment of H. E. Broadwell as western regional sales manager has been announced by Herald T. Reishus, vice president, Industrial Power division of International Harvester Company. Named as assistant manager of western region sales was Jack Bess. Listed as managers of the six territories within the western region were A. H. Mason, D. J. Doerschlag, I. S. Strand, H. C. Barlow, P. D. Evans and H. W. Pals. States included as part of the western regional sales district are Washington, Oregon, California, Nevada, Arizona, Idaho, Utah, Montana, Colorado, Wyoming, and the territories of Hawaii and Alaska.

At present, Mr. Broadwell will be headquartered at International Harvester Company's Industrial Power division plant at Melrose Park, Illinois, with Mr. Bess working from a field office in Oakland, California. Territory managers will be located in various cities throughout the various sales districts they represent.

Caterpillar Creates Engine Division

W. K. Cox

H. H. Howard W. S. Ziegler

Creation of an engine division, a new major component of Caterpillar Tractor Co., is announced by L. B. Neumiller, Caterpillar president. Coincidental with this move was an announcement by G. E. Spain, vice president, of a realignment of sales and advertising activities. The new division of Caterpillar will be managed by H. H. Howard, formerly director of domestic sales. He will have administration of the company's commercial engineering, orders, product engineering, pricing and scheduling of all engines. In addition, he will be in charge of the sale of engines to manufacturing customers.

The new organization is an outgrowth of a need to meet customer requirements. Most industrial engines sold are built to special arrangement to fit customers' applications, and the combination of existing and new attachments to achieve different customer arrangements are almost limitless, Mr. Neumiller said. Several separate groups in the company doing this special work will now be brought together within the new division. Mr. Spain announced establishment of the sales promotion department with W. K. Cox, now advertising manager, as manager of the new department. The sales training division, sales development division and the advertising department become the three divisions of the new sales promotion department. Named to succeed Mr. Howard is W. S. Ziegler, now assistant director of domestic sales, who will manage the domestic sales department. This department will concentrate its activities on administration of dealer relations and sales to the federal government.

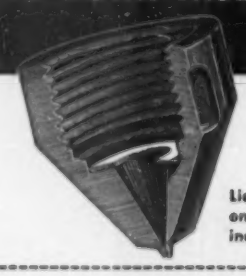
REDUCE cleaning time on Diesel engine parts with VAPOR BLAST* V-B Liquid Honing*

CLEAN PISTONS 14 TIMES FASTER... IN MAINTENANCE OPERATIONS

That's the experience of Pacific Intermountain Express, one of the nation's leading motor freight carriers, in their Diesel maintenance operations at Denver.

With Vapor Blast Liquid Honing equipment P.I.E. has cut piston cleaning time from 14 hours to 1 hour per set of six sleeves and pistons.

DE-BURR INJECTOR CUPS 8 TIMES FASTER... IN ORIGINAL MANUFACTURE



That's the experience of Cummins Engine Co., Inc., Columbus, Indiana. Write for portfolio of authenticated case histories of cost savings through Liquid Honing in the Diesel industry.

Liquid Honing removes internal burrs on injector cups which are virtually inaccessible to conventional methods.

VAPOR BLAST MFG. CO.
3005J W. Atkinson Ave., Milwaukee 16, Wisconsin

☐ Under separate cover we are sending you a part for FREE DEMONSTRATION of VB Liquid Honing. We expect a complete report with return of part.

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V-B

*"Vapor Blast" and "Liquid Honing" are trademarks.

Model 3030, Type B-20

Gulf Coast Diesel News

By Michael T. Pate

LYNN Citrus Grove, Pharr, Texas, has bought a series 71, Model 4030C General Motors diesel, delivering 85 hp., which will be used to drive a "Red Head" Stewart & Stevenson Services turbine pump. This is the third such installation the Lynn organization has purchased for incorporation in its irrigation system.

SUMNER Machine & Supply Company, Houston, has bought from Hercules Motors Corporation, Houston, a Hercules DFXH diesel developing 165 hp. at 1500 rpm. on continuous rating and is installing the engine in a dredge for inland waters.

RANKIN & Pitcock, drilling contractor firm of Wichita Falls, Texas, has purchased from Stewart & Stevenson Services, Inc., Houston a series 110 model 122400 twin-6 General Motors diesel delivering 400 hp., which will be used to power a 7¾ x 16 Gardner-Denver duplex mud pump.

COLTER Corporation, Palacios, Texas, has purchased through Cummins Sales & Services, Inc., Houston, two Cummins diesels, model HRMS 600, developing 225 hp. each, which will be used to drive 58-foot shrimpers through Snow-Nabstedt 3:1 reduction gears. Colter Corp. is outfitting the craft at their own yard.

VALLEY Acres, La Villa, Texas, has bought a series 71, model 6030C General Motors diesel rated at 120 hp. continuous load. The engine will power a Stewart & Stevenson "Red Head" turbine pump in irrigation work.

WHEELESS Drilling Company, Shreveport, La., has bought a Waukesha 6NKD diesel delivering 254 hp. at 1050 rpm. and a model 135DKU developing 106 hp. at 1800 rpm. Both diesels will be used in outfitting a drilling rig. Waukesha Sales & Service, Houston, furnished the diesels through Continental Supply Company.

KERRVILLE Bus Company, San Antonio, Texas, has secured through Cummins Sales & Service, Inc., Houston, a model NHB-600 200 hp. Cummins diesel for installation as replacement in one of the company's transcontinental busses.

INDUSTRIAL Materials Company, Pasadena, Texas, has purchased a series 71 model 6030C General Motors diesel, rated at 120 hp., to power a 6-inch sand dredge.

BEN Schultz, Wichita Falls, Texas, has obtained through Waukesha Sales & Service, Houston, a Waukesha 10 kw. diesel electric plant for standby service.

JAMES O. Russell, Jr., has bought for his shrimp boat *Texas Ranger*, home port Port Isabel, Texas, a Murphy M-190 diesel, which will drive the craft through a 3:1 Twin Disc reduction and reverse gear. The engine was furnished by Houston Engine & Pump Company, Houston.

"Engine Savers"

TWIN DISC MODEL CF TORQUE CONVERTER

"These Twin Disc Truck-Type Torque Converters are engine savers," says Bill Cross, garage foreman whose job it is to keep 30 Dart rear-dump 30-yard trucks moving millions of tons of overburden now . . . and copper ore later, at the huge open pit mine of the Anaconda Copper Mining Company at Weed Heights, Nevada.

• • •

"When what they save in labor and parts on engines and driving units and brakes on one truck is multiplied by 30, like it is here, you've got a friend you don't want to part with," adds Cross.

Twin Disc Truck-Type Torque Converters save not only engines, but brakes, axles, transmissions, clutches — they keep engines operating in their most efficient range; start heavy loads smoothly; provide firmer traction; reduce shifting and pedal braking; prevent fatigue . . . promote operator efficiency.

Twin Disc Truck-Type Torque Converters are available for all heavy duty diesel truck engines, in two distinct types—Model CF for short, steep up-and-down runs, and Model DF with lock-out feature providing direct mechanical drive for long hauls with intermittent grades.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

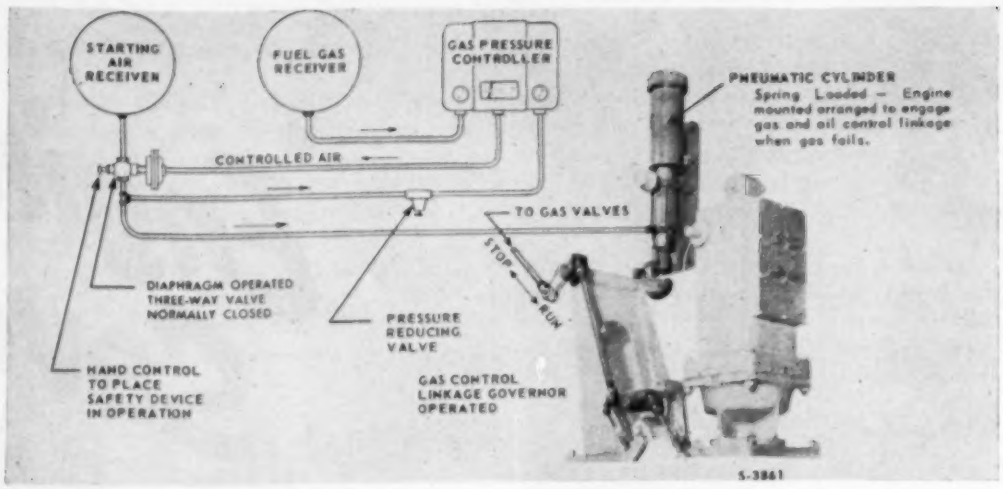
TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

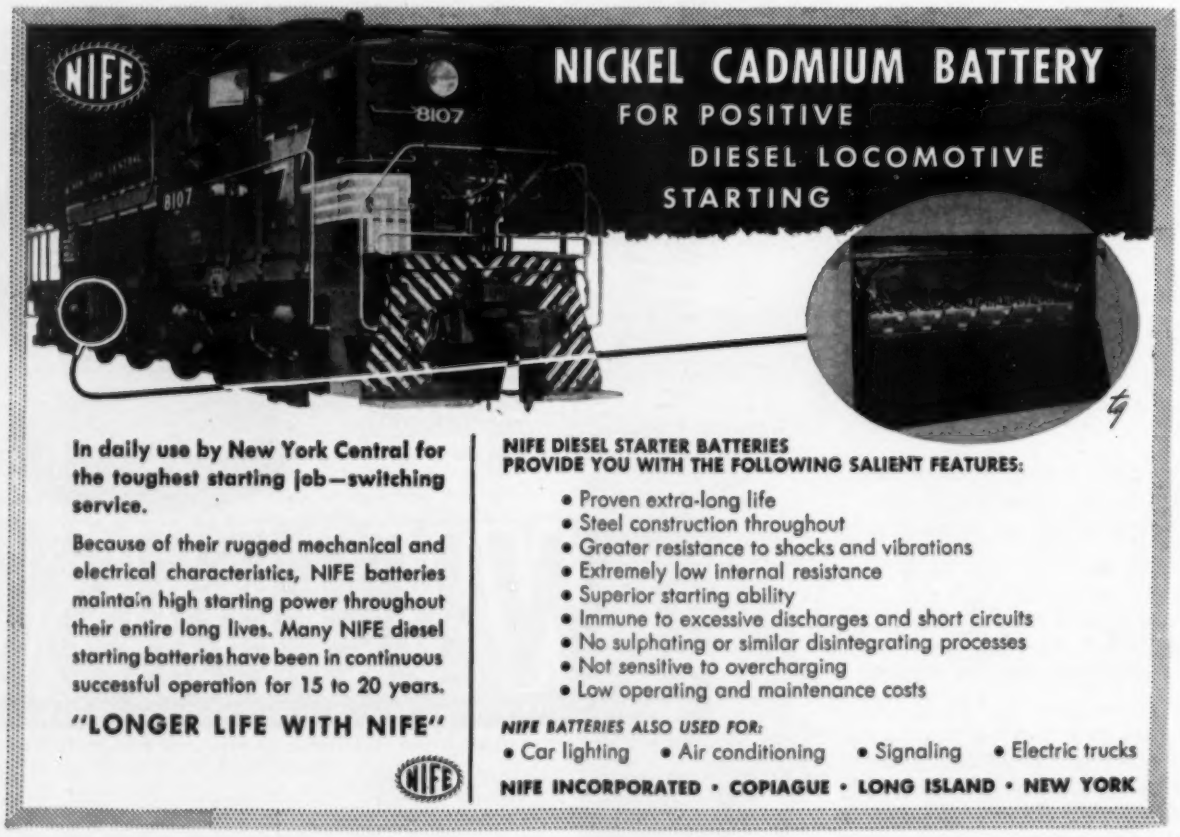
AUTOMATIC FUEL SWITCHER

WHEN generating electrical power with Worthington dual fuel diesels equipped with the Worthington patented "Automatic Fuel Switcher," power consumers will never know about fuel gas interruptions or failures. Shutdowns occurring when depending upon manual change-overs during emergencies are eliminated. When gas pressure drops below normal or fails completely, the engine automatically changes over to 100% fuel oil instantly. Whether operating on gas with pilot oil or 100 percent oil, the Worthington "Automatic Fuel Switcher" places the engine under command of the governor with full travel at its best governing efficiency. Using full travel from no load to overloads steadies governor control of the fuel metering equipment during all load changes. Until Worthington engineers developed the "Automatic Fuel Switcher," only one-half governor travel was available for either gas or oil to provide the automatic change-over—resulting in erratic regulation on generator service.


STARTING AIR RECEIVER
FUEL GAS RECEIVER
GAS PRESSURE CONTROLLER
PNEUMATIC CYLINDER
Spring Loaded — Engine mounted arranged to engage gas and oil control linkage when gas fails.
CONTROLLED AIR
TO GAS VALVES
STOP
RUN
DIAPHRAGM OPERATED THREE-WAY VALVE NORMALLY CLOSED
PRESSURE REDUCING VALVE
HAND CONTROL TO PLACE SAFETY DEVICE IN OPERATION
GAS CONTROL LINKAGE GOVERNOR OPERATED
S-3861

The "Automatic Fuel Switcher" acts immediately, when the gas pressure in the main supply line to the engine drops below a predetermined minimum —usually 25 psi. It closes the gas metering valves instantly and simultaneously shifts linkages that place the fuel pumps under control of the governor at the required setting for the load at that very moment. Consequently, there is no hunting of the governor when the engine goes over to 100 percent fuel oil. a. Engine mounted, spring loaded, pneumatic cylinder arranged to engage gas and oil control linkage when gas fails. b. Pressure controller mounted external to the engine. Controller maintains maximum air pressure on system and keeps it in balance until gas falls below a predetermined minimum value—usually 25 psi. c. Gas pressure pick-up that communicates gas supply pressure to the controller. d. Three-way valve, single diaphragm operated. It is connected in the air supply line to the pressure controller, and to the pneumatic cylinder. e. Reduction valves to step starting air pressure down from as high as 250 psi or as low as 100 psi. to 17 psi. for operation of the pressure controller.

The sequence of operation of the Worthington "Automatic Fuel Switcher" is fairly simple. First, the engine is started and brought up to speed on fuel oil. Then, before manually changing over to gas, the automatic system is engaged so that it will be ready to act in the event of gas failure. The system is engaged and placed in balance by opening the high pressure air valve (actuated by small knob on three-way valve). Air is then admitted to the



In daily use by New York Central for the toughest starting job—switching service.

Because of their rugged mechanical and electrical characteristics, NIFE batteries maintain high starting power throughout their entire long lives. Many NIFE diesel starting batteries have been in continuous successful operation for 15 to 20 years.

"LONGER LIFE WITH NIFE"

NIFE DIESEL STARTER BATTERIES PROVIDE YOU WITH THE FOLLOWING SALIENT FEATURES:

- Proven extra-long life
- Steel construction throughout
- Greater resistance to shocks and vibrations
- Extremely low internal resistance
- Superior starting ability
- Immune to excessive discharges and short circuits
- No sulphating or similar disintegrating processes
- Not sensitive to overcharging
- Low operating and maintenance costs

NIFE BATTERIES ALSO USED FOR:

• Car lighting • Air conditioning • Signaling • Electric trucks

NIFE INCORPORATED • COPIAGUE • LONG ISLAND • NEW YORK

pressure controller through the air reduction valves and to the pneumatic cylinder mounted on the engine. Through action of the controller, the high pressure air supply valve is held open as long as the gas pressure is at or above an indicated minimum pressure desired for the engine. Until the gas pressure falls below the minimum or fails completely, low pressure air from the controller, acting on the diaphragm always holds the high pressure air supply valve open.

In its raised position, the vertical plunger in the pneumatic cylinder, responding to air pressure unbalances a compression spring. In this position, the plunger remains disengaged from the levers that are connected to the gas and oil control linkage. When gas pressure falls below the minimum required for the engine, the pressure controller releases air to the diaphragm valve which then shuts off the supply air and releases pressure on both the pneumatic plunger and pressure controller. Up until the time that a failure occurs, gas metering valves remain under the control of the governor. However, at the instant of gas failure, air pressure in the pneumatic cylinder is released and the plunger, under spring pressure, engages the change-over linkage.

Immediately, this action closes gas metering valves, opens fuel pumps, and transfers governor control exclusively to the fuel oil system. When gas supply is restored to normal, the sequence of changing the engine back to gas and again placing it under control of the governor and the "Automatic Fuel Switcher" may be repeated.

Names Sales Representatives

Arthur E. Poole

Ralph Eads

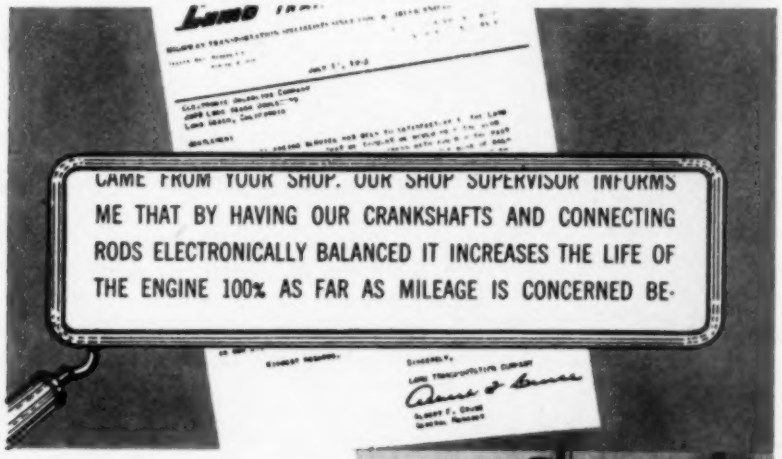
C. I. Wallace, general manager of the Industrial Filtration Division at U. S. Hoffman Machinery Corporation, Syracuse, N. Y., has announced that Arthur E. Poole and Ralph Eads have been appointed sales representatives for the Metropolitan New York-northern New Jersey and the Houston-southern Texas areas, respectively. Mr. Poole has had broad experience in sales management and product development in the chemical and allied industries. A graduate of Brooklyn Polytechnic Institute, he holds a degree in chemical engineering. He also completed a 2 year executive course in businesadministration at Rutgers University. Ralph Eads has been operating as the Eads Company at Houston. He has been active in sales engineering in this area for the past seven years. Mr. Eads was graduated from Texas A. & M. with a degree in mechanical engineering. Both are well known in industrial circles in their own areas. U. S. Hoffman manufactures a complete line of filtration equipment for the reclamation of cutting tools, coolants and other industrial fluids.

Flexonics Catalog

A new sixteen-page illustrated two-color catalog featuring Chicago Metal Hose and Flexon Expansion Joints has just been released by Flexonics Corporation, formerly Chicago Metal Hose Corp. The catalog presents all basic selection and installation data necessary to the proper application of flexible metal hose and pipeline expansion joints. Section 1 gives complete expansion joint specifications for both the low and high pressure units, including the background engineering facts essential to the selection of the proper joints. Section 2 covers specification data for the basic Chicago Metal Hose corrugated and convoluted hose constructions, as well as information on fittings. Also included in this section is complete coverage of CMH special purpose assemblies, available as standard. For a copy of this new catalog, please write Flexonics Corporation, 1325 South Third Avenue, Haywood, Illinois, asking for catalog CMH-128.

Reading Orders 5 Diesel-Electrics

The Reading Company has placed an additional order for five diesel electric 2,400 hp. Train Master locomotives with Fairbanks, Morse & Co., according to Robert H. Morse, Jr., president. When delivered, there will be a total of nine Fairbanks-Morse diesel Train Masters in use on the railroad. The five new units cost approximately one and one-quarter million dollars, and delivery will begin at an early date. They will be manufactured at the Beloit, Wisconsin, Works of the Company.


CAME FROM YOUR SHOP. OUR SHOP SUPERVISOR INFORMS
ME THAT BY HAVING OUR CRANKSHAFTS AND CONNECTING
RODS ELECTRONICALLY BALANCED IT INCREASES THE LIFE OF
THE ENGINE 100% AS FAR AS MILEAGE IS CONCERNED BE-

having our crankshafts and connecting rods electronically balanced increases the life of the engine 100%

Electronic Balancing Company in Long Beach has done custom balancing for transport firms for years, using only Stewart-Warner 704 precision electronic job-type balances made by Merrill.

C. M. Mikkelsen, shop superintendent for Crail Transportation Co., writes Electronic Balancing Co.: "We feel that the exceptionally long life of both our Cummins and Hall Scott engines is due in a large part to the balancing. Balancing, in addition to giving a smoother operating engine, will add at least 25% to the life of an engine."

Albert F. Cruse, general manager of Lamb Transportation Co., says to Electronic Balancing Co. in a letter shown above: " . . . by having our crankshafts and connecting rods electronically balanced it increases the life of the engine 100% as far as mileage is concerned before an additional overhaul." He adds that balancing makes a smoother running engine, saves clutch and cab overhaul, and greatly increases the life of the crankshafts.

Every sizeable garage, fleet shop and speed shop can install a Stewart-Warner 704 balancer and make it pay for itself the first year. Your mechanic can balance each rotating part with a change in set-up of less than two minutes.

WRITE FOR REPRINT of the balancing article in the September issue of DIESEL PROGRESS. We will also send you our latest 704 Balancer Bulletin, no obligation.

☐ Please send me the REPRINT and additional information.

☐ I would like a representative to call.

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VOLUME 18

The diesel industry is fast growing and competitive. New engines and improvements on older models are constantly being announced by the builders. Your reference must be as up-to-date as the engines on the market. DIESEL ENGINE CATALOG is that kind of reference book. Unless you make use of the latest edition, Volume 18, you are not getting the information you want and need. Products of every major engine manufacturer are described and illustrated in Volume 18. Specifications are included.

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If you use, buy, sell or service diesel, dual-fuel and gas engine, or write specification on their applications, Volume 18 of DIESEL ENGINE CATALOG is your book. Over 400 pages of vital engine and accessory information is yours for only $10.00. DIESEL ENGINE CATALOG, Volume 18, is a big book from every standpoint. Its large 9-inch by 12-inch pages are easy to read. Its index makes the information you want easy to find.

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Enter my order for a copy of the DIESEL ENGINE CATALOG, Volume 18, edited by Rex W. Wadman, for which I enclose $10.00 (plus sales tax if for delivery in California). Copies may be ordered in the Sterling Areas by remitting £4:0:0 to DIESEL PROGRESS, St. Paul's Corner, Ludgate Hill, London, E.C.4.

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TITLE.....COMPANY.....

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CITY.....ZONE.....STATE.....

Inland River Reports

By David I. Day

THE UPPER Ohio above Portsmouth, O., was very busy the last 30 days, coal towboats being most noticeably in evidence. Other trades showed similar activity. We noted more slag moving than on any trip in years. The *A. V. Criss, Jr.*, of the Atlas Towing Company, Parkersburg, West Va., was in charge of the best tow, six or eight barges. She was known for years as the *Kansas City Socony*. In charge of the engine room was Earl Hubbard.

LIKE THE *A. V. Criss, Jr.*, the *Frank C. Rand* is powered by Superior diesel engines, both appeared to fine advantage in handling their tows and while the *Rand* is much the newer boat, both were functioning with equal engine smoothness. Women in a New York car were photographing the *Rand* back of a flock of empties and several barges of sulphur and scrap.

AFTER A considerable absence working on the lower Mississippi and the Louisiana canals, it was a pleasure to see the *Claude Tully* of the Patton-Tully Transportation Company as she was pulling up to Dam 20. This 3200-hp. boat, powered by twin Fairbanks-Morse engines, was built by St. Louis Ship about 1950. She measures 150 x 35 x 10 and runs like a racer in pleasant waters.

WE WISH to compliment Chief Engineer J. C. Rayburn o fthe American Barge Line's diesel vessel *Advance* for the efficient operation of the engine room as she pased up the Ohio recently. The boat is rated at 2880 hp., is Fairbanks-Morse engined, and is a product of the Jeffersonville Boat & Machine Co., Jeffersonville, Ind., coming out new in 1949.

PITTSBURGH rivermen bade a silent goodbye a few weeks ago to the last of the highly-rated fleet of steamboats so long identified with the river operations of Jones & Laughlin Steel Corp., the final steamer being the *C. D. O'Connor*. The old boat being towed by the M.V. *Lady Ree* of Greenville, Miss., and will become a quarterboat in the Louisiana oil fields. Ohio River folks were pleased with the *Lady Ree*, built at the Avondale yards two years ago. Her General Motors twin engines were running efficiently as she made this bit of river history.

THE LARGEST tow of coal seen by your correspondent on the Ohio for years was in charge of the famous pusher, *Charles R. Stevenson*, once the *Sohioan* and then the most powerful towboat on the inland waterways. The *Stevenson* was pushing 20 barges totaling 18,000 tons going upriver. She has a wonderful engine room—the main items, of course, the two Fairbanks-Morse units.

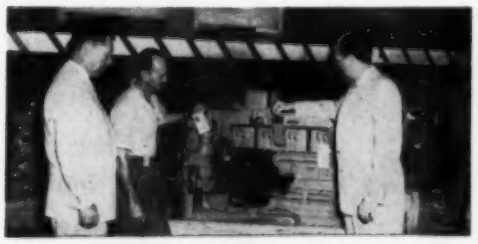
A GROUP of leading Chicago businessmen took a look at upper Mississippi river towing around the 20th of August. They were impressed with the performance of the *Hortense B. Ingram*, with her General Motors engines humming in the morning air and with the *Helena*, immediately following, pushing 18,000 tons of general merchandise, sulphur and coal with little strain on her 3600 hp. GM engines. (The *Helena* was once a steamboat.)

Air-Maze Appointments

The appointment of Frank P. Purvis to the newly created post of general sales manager, as well as that of Harold E. Donovan as railway sales manager, has been announced by W. B. Watterson, vice president of sales of the Air-Maze Corporation, Cleveland, Ohio. Mr. Purvis was formerly Chicago district manager for the past seven years for the Air-Maze Corporation. Previous to that he had been connected with the engineering and sales engineering departments of the Cooper-Bessemer Corporation and Packard Motor Company. He received his mechanical engineering training at Penn State University. Mr. Donovan is an engineering graduate of Marquette University and makes his headquarters in Chicago.

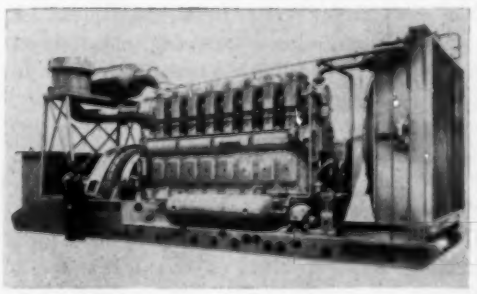
The Air-Maze Corporation manufactures air filters, liquid filters, intake silencers, and other equipment for the heating and ventilating, diesel engine, air compressor, and aircraft fields.

South African Visitor



C. H. Kiley, technical advisor, Road Motor Services, South African Railways (second from left) examines a 200 horsepower Model NHB-600 Cummins diesel. Shown at the right is Ivan Turner, Cummins Diesel Export Corporation area representative for Africa, and E. Don Tull (left) vice president and general manager, Cummins Engine Company, Inc. The scene—shipping room in the Cummins factory at Columbus, Indiana. Mr. Kiley spent a week at Cummins learning the latest service techniques and maintenance procedures. South African Railways operates a total of 231 Diamond T tractors, all powered with 200 hp. Cummins diesels, on feeder lines from its vast African transportation system. Sixty more Model NHB-600 Cummins diesels are scheduled to be incorporated in Diamond T Bus chassis and delivered to the South African Railways, in the immediate future.

New Portable Power Plant



A new 1000 kw. portable diesel generator set has been added to the Enterprise line. Recently shipped to the far east, the unit shown is one of several now generating electrical power at remote points. The heavy duty diesel generator unit is wholly self-contained on a skid mount. Fuel tanks, cooling radiator, control panel and all necessary gear are mounted on a common skid. The unit can be ocean shipped or trailer transported, ready for generation of electrical current on arrival. Present uses of this and similar Enterprise units are in dam construction, power for air field clearing, emergency power in distress areas, pumping large volumes either by direct drive or with generated electrical energy and for supply power for all types of construction equipment.

The largest of these skidded power plants is approximately 35 feet in overall length. Smaller units in the 100 to 500 kw. range are approximately 10 feet overall length. Weight range is from 5½ to 22½ tons.

Radiator Research

A research project for the Harrison Radiator Division of the General Motors Corporation, is being conducted at Rensselaer Polytechnic Institute by Dr. Ernest F. Nippes, head of welding research at the Institute. Dr. Nippes and associates are investigating joining problems in the substitution of aluminum for copper in automotive radiator and heating unit construction. The present contract is a renewal of one under which a year's study has already been made. The contract of the Harrison Radiator Division with the Institute calls for completion of this phase of the investigation by July 15, 1954, reports Dr. Wendell F. Hess, director of Rensselaer Research.

more horsepower a problem?

less weight per horsepower a problem, too?

There's an easy way to keep pace with the race for more engine horsepower . . . without adding weight per horsepower, without sacrificing valuable space. *Specify Miehle-Dexter Superchargers.* You'll register a big gain in horsepower—up to 50% or more—and the additional investment in equipment will be far less by comparison with other methods.

And when you put M-D Superchargers on your engines you're assured of efficient operation plus long life and low maintenance service. Exclusive M-D features make this possible. Result: dividends in fuel economy and maintenance costs.

On small jobs as well as large, M-D engineers will be glad to work with you—to help you get the exact size and type of supercharging equipment for your purpose. Write for technical brochure with specifications and performance data.

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are engineered to match your exact requirements

Typical gear driven, flange mounted M-D Supercharger. Develops 350 c.f.m. at 10,000 r.p.m. Other models with capacities to 4,000 c.f.m. available.

Direct driven, pad mounted, Model 3710D. Maximum 950 c.f.m. at 7000 r.p.m.

Belt driven, pad mounted Model 3611 develops 1250 c.f.m. at 3000 r.p.m.

Supervisors at an Arizona pit mine report big, fast-moving M-D supercharged Diesel trucks climb stiff grades with power aplenty . . . sharply cut maintenance costs in moving overburden.

Supercharged Diesel power pays off in this coal crushing plant. The M-D Supercharger puts 50% more horsepower in the engine . . . reduces weight per horsepower by 50%. Easier portability.

MIEHLE-DEXTER SUPERCHARGER

DIVISION OF THE DEXTER FOLDER COMPANY

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Buda To Join Allis-Chalmers

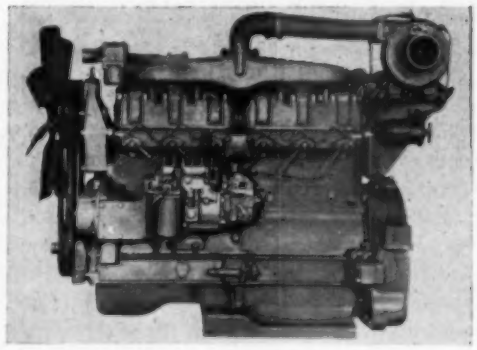
A special meeting of the shareholders of The Buda Company, Harvey, Illinois, was called for September 10, to consider an agreement and plan of reorganization providing for exchange of all assets of the firm for shares of Allis-Chalmers Manufacturing Company, Milwaukee. The plan provides for exchange of all Buda assets for the Allis-Chalmers shares at the rate of one share of Allis-Chalmers common stock for each 2-1/6 common shares of The Buda Company, subject to an audit of Buda assets now in progress. There are 413,498 Buda shares of common stock outstanding. A letter to approximately 2,500 Buda shareholders containing proxies for the special meeting, signed by Stewart S. Hathaway, chairman, and Ralph K. Mangan, president, said Buda directors had unanimously approved the plan. They recommended similar approval by the shareholders "because of the favorable exchange ratio."

The Allis-Chalmers board of directors has approved the plan, according to W. A. Roberts, Allis-Chalmers president. The Buda Company was founded in 1881, originally building railroad equipment. The Buda Company today manufactures an extensive range of diesel and gasoline engines, fork lift trucks, industrial plant tractors, lifting jacks, earth drills and maintenance of way equipment. Buda employs approximately 2200 people in their two plants at Harvey, Illinois. In the fiscal year ending July 31, 1953 Buda had a gross sales of approximately $30,000,000.

Allis-Chalmers is a large user of diesel engines, particularly in the construction equipment field. The firm, organized 106 years ago in Milwaukee, manufactures a broad line of farm machinery, construction machinery, electrical equipment and miscellaneous industrial equipment. It employs approximately 37,000 people and 1952 sales from 11 plants in the United States, two in Canada and two in England were more than $513,000,000. The tractor division plants of Allis-Chalmers are located in Milwaukee, which produces wheel tractors; La-Porte, Indiana, harvesting equipment; Springfield, Illinois, industrial crawler tractors and road graders; Cedar Rapids, Iowa, motor scrapers and wagons; Gadsden, Alabama, cotton pickers and rear engine farm tractors; LaCrosse, Wisconsin, farm implements; and Oxnard, California, deep tillage implements.

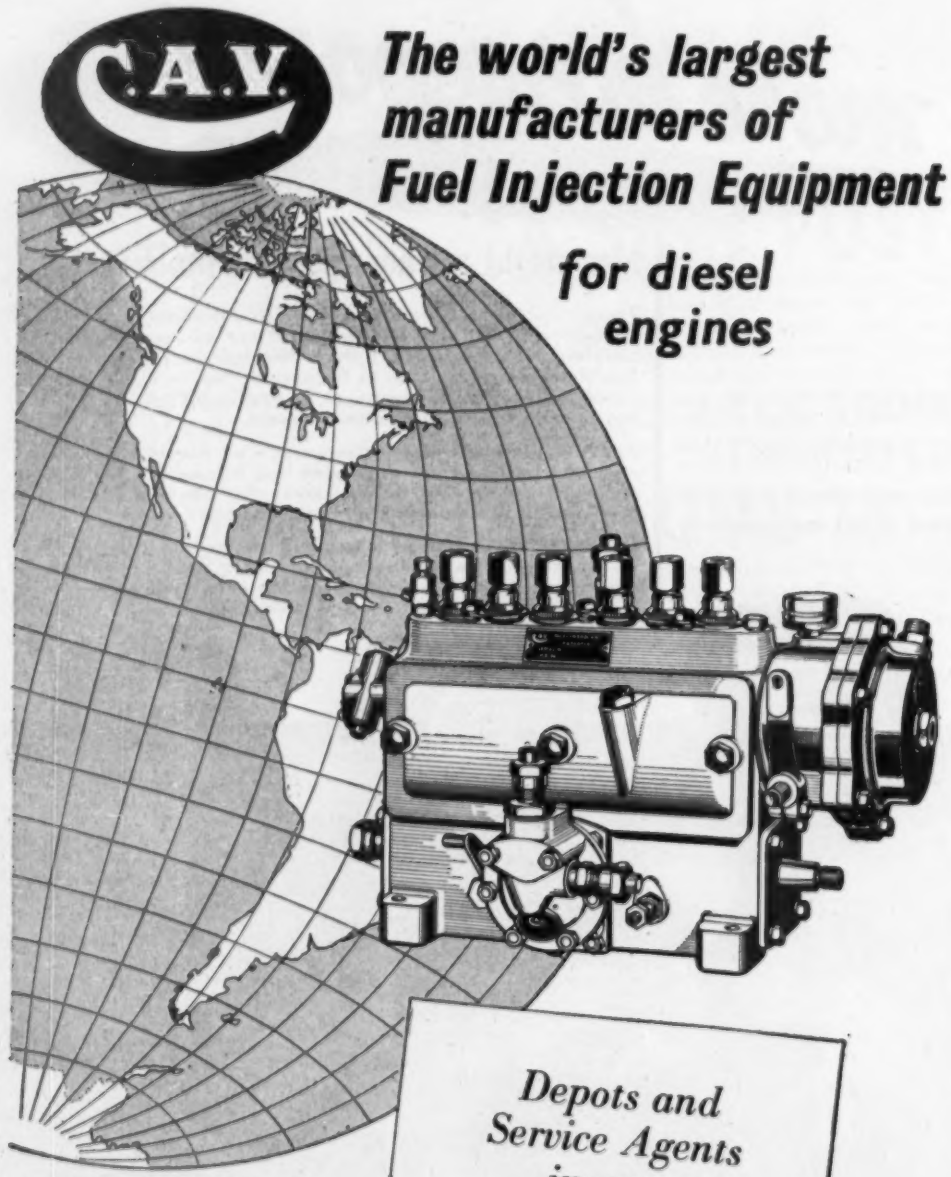
Allis-Chalmers general machinery plants are in Milwaukee, Wisconsin, which manufactures electrical and industrial equipment; Boston, Mass., circuit breakers; Pittsburgh, Pa., transformers; Norwood, Ohio, pumps, motors, Texrope drive sheaves, and Terre Haute, Ind., compressors for jet airplane engines.

Introduces Turbo-Supercharged Engine



Hercules Motors Corporation, Canton, Ohio is now producing a turbo-supercharged version of their 6 cylinder diesel engine Model DFXE. The new engine designated, DFXE-TS, has a 5⅝ in. bore x 6 in. stroke and 895 cubic inch piston displacement. The DFXE-TS develops 846 lbs. ft. torque at 1800 rpm. and 318 hp. at 2000 rpm. The non-supercharged version of this engine has been quite successful in many different applications. The supercharged version fulfills the demand for more horsepower without increasing fan-to-flywheel length. The DFXE-TS is particularly suited to power construction equipment, oil field machinery, mining equipment and other equipment in the 300 hp. class where a compact engine is important.

Engineering features include: forced feed lubrication by gear pump to all connecting rods, main bearings, piston pins and rocker arm bearings; 7-bearing, counterbalanced, Tocco hardened crankshaft; high alloy steel valves with valve rotators; exhaust driven supercharger; heat treated aluminum alloy pistons; full floating piston pins of alloy steel; rifle drilled, heat-treated nickle chrome moly steel connecting rods,and selection of governor to suit application.



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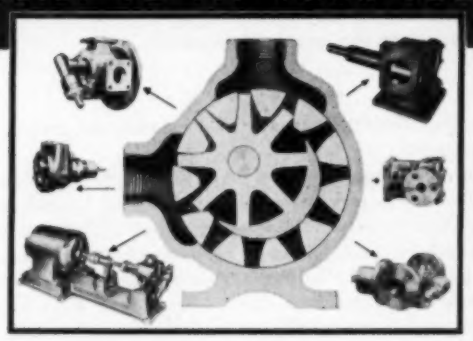
For operating throttles, chokes, fuel pump racks, anti-dieseling devices, or any application not requiring more than 10 lbs. pull over ½" stroke. Ruggedly constructed and entirely enclosed for dust and splash proof operation. It is furnished with a mounting bracket and threaded plunger for connecting to operating linkage.

Overall length, plunger out, 4½". Overall width of mounting ears 3⅛". Weight 2½ lbs. Special plungers can be supplied if required.

COMPACT • DUST PROOF • LIGHT WEIGHT

SYNCHRO-START PRODUCTS, INC.
Automatic Engine Control Equipment
8151 N. RIDGEWAY AVE., SKOKIE, ILLINOIS

SAVE *with* VIKING ROTARY PUMPS BUILT TO FIT YOUR JOB!



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Here are two good reasons . . . these Pritchard Cooling Towers shown above. They provide maximum operating efficiency in the cooling systems of the modern diesel operation at the Central Electric and Gas Company in Chamberlain, South Dakota. The need for such efficiency is the reason this progressive company chose Pritchard.

Built by Pritchard — a founder member of the Cooling Tower Institute — means experienced, expert design and quality construction that provides long, dependable cooling service. Every Pritchard tower is thoroughly engineered and adequately sized for maximum efficiency, minimum maintenance . . . is *unconditionally guaranteed* to meet your most exacting performance requirements. That's why — both when you buy *and* over the years — your best value is Pritchard!

Pritchard QUINTAIR* *Air-Cooled Heat Exchangers are accepted throughout the industry as the quality equipment for cooling diesel engine jacket water and lubricating oil. Practical Pritchard design simplifies maintenance, increases operating efficiency. Single units may be used for two or more simultaneous cooling jobs. Shipped completely fabricated . . . ready for fast, easy installation.*

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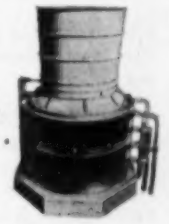

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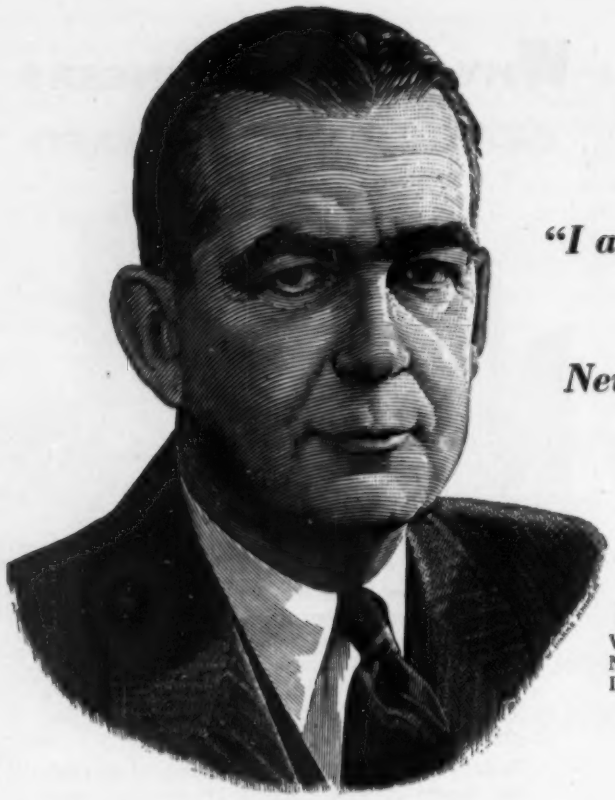

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Fortunately for America, industry and business recognize that "the security of the Nation rests upon the security of the individual."

More than 45,000 companies offer their employees the Payroll Savings Plan. In many of these companies more than 60% of the employees are Payroll Savers—in some, participation is 75%, 80%, and higher. But, in others participation is low—sometimes less than 25%.

Why does Company A have an employee participation of 75% while Company B—about the same size, in the same industry, with the same wage scales—has less than 25% of its employees enrolled in the Payroll Savings Plan? Is it because the employees of Company B are not concerned about their future, have no interest in personal security?

Men who head up industry-wide committees for the promotion of the Payroll Savings Plan... members of the Payroll Savings Advisory Committee... State Directors of the Treasury Department—any of these men can give you a quick answer:

"In every company with a good Payroll Savings Plan you'll find a top executive is heart and soul behind the plan—and everybody in the company, down to the last man in a subsidiary plant, knows it. When you find a company with a poor Payroll Plan the 'top man' will tell you, 'Yes, we have a Payroll Savings Plan... No, I don't know how many employees are enrolled or what the average monthly saving is. Mr. ———— takes care of that.'"

Currently, upwards of 8,000,000 men and women are enrolled in the Payroll Savings Plan. The 1954 goal—9,000,000—can be exceeded if you and other executives will take a personal interest in your company's Payroll Savings Plan. Any information and all the help you need to build a successful Plan can be obtained promptly from Savings Bond Division, U. S. Treasury Department, Washington Building, Washington, D. C.

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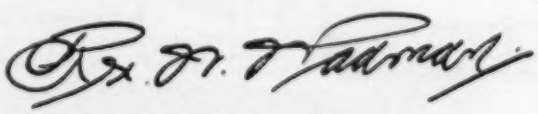


Editor—DIESEL PROGRESS

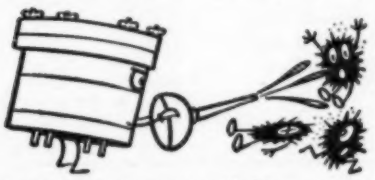
As advertised in TIME, NEWSWEEK and BUSINESS WEEK

AIR-MAZING FACTS

BY O. SOGLOW

DUST DEADLY AS BACTERIA. Certain types of dust are extremely harmful to human beings. Quartz dust, for example, can sometimes lead to diseases such as silicosis, cancer and tuberculosis.

TRAPS DUST! Air-Maze air filter panels keep troublesome dust out of hotels, railroad cars, commercial and industrial buildings. Cleaning bills are cut, employees and customers are happier. Air-Maze filter panels are easily cleaned, have high dirt-holding capacity.



STOPS DUST WITH OIL! Air-Maze oil bath filters literally "scrub" intake air in a pool of oil. Used on large diesel engines and air compressors, they keep damaging dust and dirt from moving parts.

WHETHER YOU BUILD OR USE engines, compressors, air-conditioning or ventilating equipment, *or any device using air or liquids* —the chances are there is an Air-Maze filter *engineered* to serve you better. Representatives in all principal cities. For condensed product catalog write Air-Maze Corporation, Cleveland 28, Ohio.

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The Filter Engineers

AIR FILTERS
SILENCERS
SPARK ARRESTERS
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GREASE FILTERS

Florida Diesel News

By Ed Dennis

POWERED with a Lathrop diesel engine, the *Sea Duce* is the latest "package unit" trawler delivered by Marine Motor Sales Corp. of Jacksonville to John Bolger of Dunedin. Included along with the model DH 200 Lathrop diesel, Surrette batteries, Marine Products bilge pumps, etc.

A WAUKESHA model 180 DAC 10 kw. diesel generator set was included in the engine room of the rejuvenated menhaden fishing boat *Bebeco*. Other new equipment was a Quincy air compressor, and a D 397 Caterpillar diesel engine with a Falk 2.8:1 reverse and reduction gear.

AT JACKSONVILLE the Florida Diesel Engine Sales delivered GM 110 diesels to the newly launched *Billy Bailey* and the *Carolyn* and a GM 6-71 diesel for the *Brant*.

HALLETT Manufacturing Co. announced the appointment of Nelson Praigg as vice president in charge of Eastern Sales with headquarters in the Warner Bldg., Washington, D.C. and Don Foyer as the New York office district manager with offices in the Grand Central Building.

SUPERIOR Engine Div. of National Supply Co. received the contract to supply the two 1440 hp. Superior diesel engines to be installed at Marathon for the Florida Keys Co-op. Each one is rated at 1000 kw. Vapor Phase system will also be used as well as #94 DeLaval centrifuges.

AUTO MARINE ENGINEERS of Miami supplied the two 60 kw. Sterling diesels with Westinghouse generators for Santa Rosa, Cuba; and 3 General Motors 6-71 diesels for Compana de Pesca in Havana.

MINNIE HA HA, a lobster boat, received a 100 hp. Cummins diesel model AMR 602 with a Twin Disc clutch, Cummins Diesel Engines of Fla. also supplied the model JMS 601-5 rated at 150 hp. for the *Dorothy 5*, another lobster boat.

AT HOMESTEAD we looked at the latest additions to the power plant; two model 33 D 16 Fairbanks Morse diesel generating sets rated at 1600 hp., 1125 kva. each with Woodward governors and Hilco oil filters.

THE M.V. *Jimenod* of Roatan, Honduras, bound for Central America after unloading 10,000 stalks of bananas at a Florida port; powered with a 1000 hp. Enterprise diesel, also in the engine room are two 30 kw. Hercules diesel generating sets; Capt. Cabds on the bridge.

THE *Lady Moore* of Nassau British West Indies was repowered and converted to a freezer ship, originally called the *El Mexicano*, she is powered with two 500 hp. General Motors diesels.

AT TAMPA, the Skipper Shipbuilding Co. installed a 7½ hp. Hallett diesel generating set on the *Earline G*, a 72x22 trawler built for C. D. Glover and powered with a D 13000 Caterpillar diesel.

ADVANCE WARNING ...against engine damage

How much **of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?***

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

Cylinder Overload — Preignition
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Get the best from your diesel—minimum fuel consumption per horsepower and long service uninterrupted by foreseeable breakdowns. Get constant protection of your engine, cylinder by cylinder, with an Alnor engineered Exhaust Pyrometer System.

Get Full information—Quickly! **Your nearby Alnor Diesel specialist is conveniently listed in the classified directory. Ask him to help you select the Pyrometer and thermocouple assembly designed for your engine. Or send for Bulletin 4361 with complete details of the full Alnor line of Pyrometers.**

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Man knows only that which he can measure

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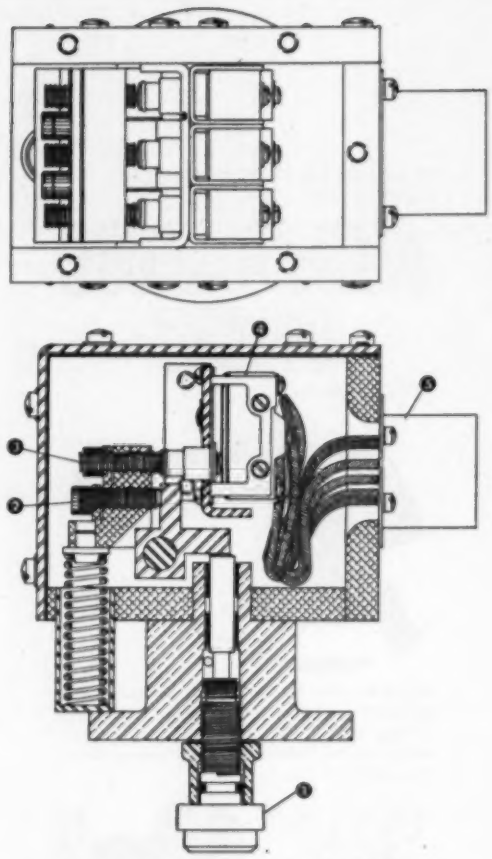
Room 508, 420 N. La Salle St., Chicago 10, Illinois

SIMPLIFYING LOCOMOTIVE TEMPERATURE CONTROL

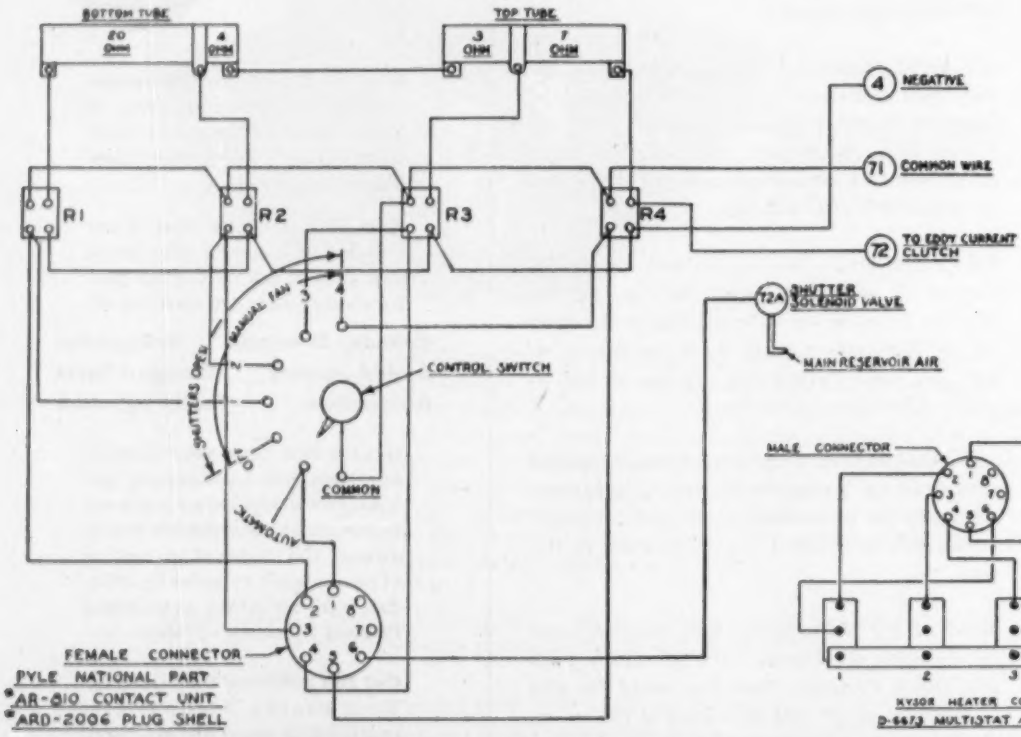
SIMPLIFICATION and elimination of a lot of the complicated switches and wiring which are now used to control engine operating temperature on locomotives is the purpose of the new Kysor Multistat unit. Manufactured by the Kysor Heater Company of Cadillac, Michigan, the Multistat combines simplicity, efficiency and dependability for locomotive engine control temperature.

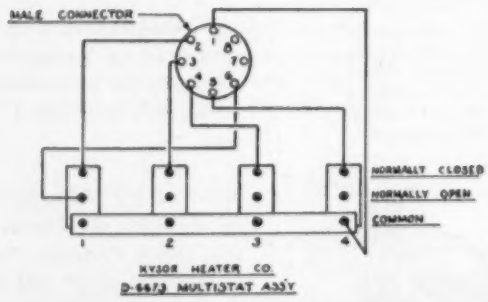
The Multistat is available with 3, 4, 5, and 6 switch stages. The overall size of the largest 6-stage unit is approximately 6 in. wide by 6 in. high by 6 in. front to back. Only one thermostatic element is used to control all switche stages. As a consequence, it is not possible for the thermostatic element to get out of phase as is characteristic of multiple thermal switch units.

The temperature setting of switches may be adjusted from ½ degree F. to over 10 degrees F. between each switch. The switch operating sequence may be selected and positively locked. This construction makes it impossible to get out of proper sequence of operation. As a result, the Multistat is inherently a unit with wide latitude of adjustment and accuracy. Switches are precision double throw,

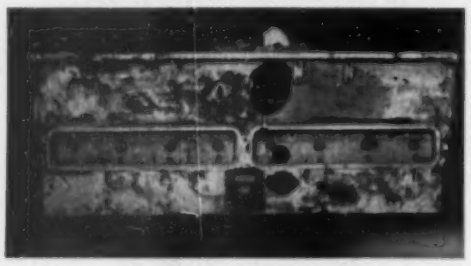


Cross section of the Kysor Multistat. 1. Thermostatic power element. 2. Master adjustment. 3. Individual switch adjustment. 4. Precision double throw heavy switch. 5. Multiple conductor plug connector.





Typical installation wiring diagram of the Kysor D-6673 Multistat.



YOU ARE SPENDING TOO MUCH *if you're thinking of replacing it!*

. . . because your cracked or shattered casting can be returned to as-new condition by the GUTH FUSION PROCESS at a fraction of its replacement cost.

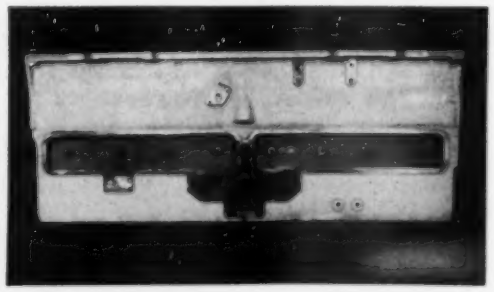
WHATEVER THE CONDITION OF YOUR CASTING

Even if you have to sweep up the pieces in a basket, Guth-Pascoe can repair it as good as new and guarantee satisfactory and efficient service.

•

Illustrated is a 1125 DAS Buda Diesel engine block as it was received after "throwing a rod" and as it left our plant after being repaired. There is practically no limit to the size and complexity of castings which can be restored. All ferrous and many non-ferrous metal castings can be repaired the Guth-Pascoe way! It will pay you to investigate Guth-Pascoe when an emergency arises.

•



GUTH-PASCOE COMPANY

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EMERGENCY RUSH SERVICE DAY OR NIGHT . . . SUNDAYS AND HOLIDAYS INCLUDED

high capacity with nickle silver alloy contacts and special heat resistant cases. Removal of the service cover makes all parts readily available. The cover is gasketed and sealed to prevent tampering. The thermostat power unit may be replaced without disassembling the Multistat. All wiring is carried through a heavy duty multiple conductor plug connector.

Although the Multistat contains few moving parts, and these with very little required motion, all moving parts are hard chromium plated. The entire unit is corrosion protected by chromium plating metal treatment, anodizing and the use of non-corrosive materials.

Field Sales Office Assignments

Assignment of three representatives to sales offices has been announced by The Trane Company, La Crosse, Wisconsin, manufacturer of air conditioning, heating and ventilating equipment. Raymond O. Goodman has been assigned to the Chattanooga, Tennessee, office. He has a B.S. and architectural engineering degree from Virginia Polytechnical Institute and has completed the Trane Graduate Training Course. Robert E. Murphy has joined the Milwaukee, Wisconsin, sales office. He is a mechanical engineering graduate of Syracuse University and had four years of experience as assistant plant engineer before joining the Trane firm. Richard E. Haskins has been assigned to the Oklahoma City, Oklahoma, sales office. He is an engineering graduate of South Dakota School of Mines and of the Trane Graduate Training Course. He has been associated with the firm since 1947.

Expands Chicago Office

R. L. Moore

The appointment of R. L. Moore as sales engineer to Cooper-Bessemer's Chicago office has been announced by Stanley E. Johnson, vice president in charge of sales for The Cooper-Bessemer Corporation, Mount Vernon, Ohio. Working under the direction of Charles L. White, district manager, and Robert Bowie, Chicago office manager, Mr. Moore will devote his efforts to the engineering and sales of diesel and gas engines, air and gas compressors for manufacturing and chemical operations in the Midwest. "The expansion of factory-trained field personnel in this office," explains Mr. Johnson, "is another step in Cooper-Bessemer's long-range plan to attain the closest possible contact between the factory and the ultimate users of Cooper-Bessemer equipment. Only by such close support does it become possible to insure top performance of each piece of equipment in the field."

A graduate of the University of Toronto, Mr. Moore was with the Royal Canadian Air Force for five years before his association with Cooper-Bessemer. For the last several years he has been engineering the application of compressors to essentially every type of industry.

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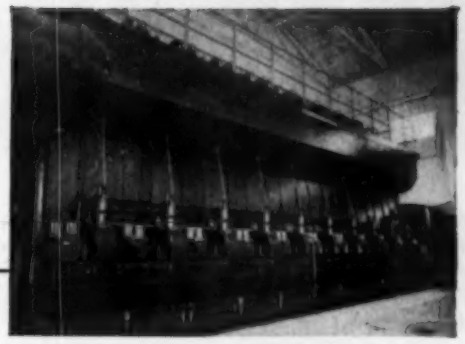

Leading Diesel engine manufacturers *know* that buyers appreciate the trouble-free service given by Manzel protected equipment. They *know* that Manzel Force Feed Lubricators never forget or make mistakes . . . that they always supply every wearing point *exactly* the amount of oil it needs. As a result, moving parts function efficiently for many more years.

Standard equipment on leading makes of diesel engines, compressors, and other machinery. They can be installed on your present equipment.

We will gladly have a Manzel lubrication engineer submit recommendations without obligation. Just write . . .

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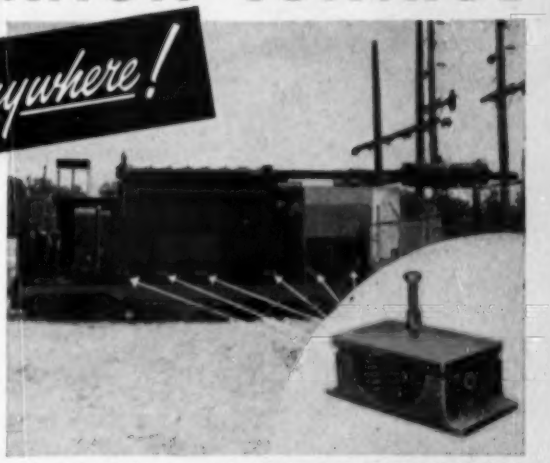
This installation of a heavy 550 HP Baldwin on a truck trailer proves we really mean it when we say "Install Engines Anywhere".

You CAN install engines *anywhere* (on truck trailers, railroad cars, ships, in hospitals or office and apartment buildings) with positive freedom from objectionable vibration by using Korfund Vibration Control units.

Economical, *effective* Korfund units stop vibration, and reduce engine and building maintenance costs; reduce noise level; and frequently eliminate the need for special foundations.

For more information, see our page in the "Diesel Engine Catalog", or our catalog in Sweet's Files—or write for your copy of our Bulletin No. 16. A half-century of experience is at your disposal. Representatives in principal cities.



Korfund Vibro-Isolators permit installation of this 550 HP Baldwin diesel engine generator without a special foundation on a truck trailer operated by Rural Cooperative Power Ass'n, Elk River, Minn. Even though the trailer twists and pitches while traveling over rough fields, Korfund units prevent any distortion of the engine generator . . . a most severe test.

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Are you a contractor buying new power for your equipment? Are you an engineer designing a new plant? Do you need a certain engine to meet certain requirements? Do you sell engines and want to know what your competition is doing? Do you use or service diesel, dual-fuel or gas engines? THEN YOU NEED VOLUME 18 of DIESEL ENGINE CATALOG!

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This new edition of DIESEL ENGINE CATALOG gives you five big sections, five books in one:

- An engine section fully illustrated with complete technical descriptions and specifications.
- An accessory section describing engine and plant accessories.
- A transmission section describing torque converters, etc.
- A classified buyers' guide giving valuable information as to the source of many items you buy in the diesel industry.
- The advertising section which further details the manufacturer's product.

COMPLETELY RE-EDITED

Improvements and changes are normal to a healthy, growing industry. Unless your information source brings you up-to-date on all these changes and improvements, you are not receiving the maximum benefits due you. Volume 18 of DIESEL ENGINE CATALOG performs this service. It is new. It is complete. It is as modern as the latest engine improvement. Every major engine manufacturer is represented between its two covers. It answers your need for complete, concise and easy to read information.

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Appointed General Manager

Frank C. Edwards

Announcement was made last month by Harnischfeger Corporation regarding the appointment of Mr. Frank C. Edwards as general manager of the P&H Diesel Engine Division in Crystal Lake. Announcement was released by Mr. Henry Harnischfeger, executive vice-president of the corporation, from its main offices in Milwaukee. Mr. Edwards, whose entire business career has been spent with Harnischfeger Corporation, has served the company in a number of different capacities since he first began his employment in the company's Milwaukee shops in 1925. Since that time, he has been affiliated with various of the corporation's district offices, among which were those in Memphis, New York, Jacksonville and Pittsburgh. He also was general manager of the company's former truck crane plant in Newark, New Jersey—the manufacturing operation which preceded the company's present plant in Escanaba, Michigan. For the past 4 years, he has held the position of sales manager of P&H's Small Excavator Division. Mr. Edwards is a graduate of the University of Nebraska, from which he holds M.E. and B.S.M.E. degrees. He took over his new responsibilities as general manager of the diesel plant on September 1.

Operations of the P&H Diesel Engine Division were moved to Crystal Lake in October, 1951, at which time the new plant was ready for occupancy. It is regarded as one of the most modern plants in the industry. The diesel engines manufactured here range in size from 1 to 6 cylinders and from 20 to 138 hp. P&H diesels are used in many fields as power for various types of equipment, as for example, in the construction industry, marine field, petroleum, agriculture, public utilities, mining and quarrying, as well as industrial applications, electric generating, etc. While the P&H diesel brings many features of modern design, one of the most notable is the ease of servicing through simple replacement of complete cylinder liner assemblies, which reduces servicing time to a new minimum.

Mine Shovel

Working deep under the Cumberland Mountains in a limestone mine near Crab Orchard, Tennessee, this ¾-yard Marion shovel moves up to 140 tons of rock per hour. The unit, operated by the Southern States Lime Corporation, is powered by a General Motors two-cycle diesel engine. The shovel works 8 to 10 hours per day, but due to adequate ventilation in the mine and the non-toxic characteristic of diesel exhaust, regular tests show that there is no hazard to employees.

Halves Fuel Costs

Near Annesville, Pennsylvania, R. O. Murphy operates this Lima Paymaster with a one-yard bucket on a coal stripping operation. The Lima was converted from gasoline power with a 110 hp. Model HRIP-400 Cummins diesel nearly two years ago. Fuel costs have been cut in half, and maintenance costs and downtime have been held to a minimum.

Van der Horst Seminars

With the idea that it pays to know what you are buying, the Van der Horst Corporation, Olean, N. Y., instituted a series of customer seminars, September 18th. The purpose of these seminars is to bring the customer, as a guest, to the scene of operation where he can see at first hand how Porus-Chrome and Vanderloy are produced and how they are used. Each seminar, which lasts two days, is programmed and includes only one customer at a time.

The Pennsylvania Railroad was the first to take advantage of these meetings. As time goes on plans are to schedule one a week. The next to attend is the New York Central with invitations having been sent out to other railroads, engine builders, etc. Van der Horst Corporation reports a favorable customer reaction to the plan.

The first day of the seminar consists of a review of electroplating principles in the Engineering and Research Building and a tour of the laboratory. The afternoon session includes a step-by-step study of the Vanderloy process in production. The morning of the second day is devoted to a step-by-step study of Porus-Chrome process in production. In the afternoon, those attending have a class-room session which goes into the use of inspectroscope, dial bore gage and micrometers; what defects to look for in a cylinder both before and after plating; design of plating fixtures; and the showing of the technicolor film "Cradle of the Giant." Discussion and question-and-answer periods are held during the course of the seminar.

Motor Boat Show

The world's largest roofed-over, unobstructed floor area will be the scene of the 1954 National Motor Boat Show next January. Held at the state owned Kingsbridge Armory in the borough of the Bronx in New York City, the 1954 show will also be the occasion of the 50th anniversary of the National Association of Engine and Boat Manufacturers. This Golden Jubilee Boat Show will provide all exhibitors with first floor space and will run for nine consecutive days from January 15th through January 23rd. The exhibition area is equal in size to four football fields.

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. . . a complete revision of an important reference book with many new engines, new models and new ratings included. No other book is as new. No other reference source brings you such up-to-the-minute diesel, dual-fuel and gas engine data. DIESEL ENGINE CATALOG, the "bible of the diesel industry," can be ordered in its finest, most complete Volume 18.

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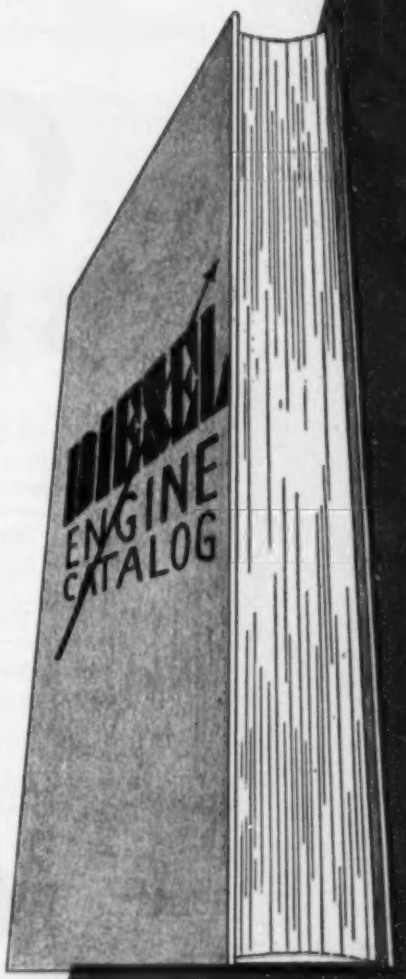
VOLUME 18

DIESEL ENGINE CATALOG is the only volume of its kind written and edited by experts under the critical guidance of Rex W. Wadman, editor and publisher of DIESEL PROGRESS. It includes the latest specifications, essential data, descriptions and illustrations of products of every major engine builder.

In addition, the classified buyers section, the accessory section, the transmission section and the advertising section bring you an additional wealth of vitally important information . . . information you must *have* at your fingertips for efficient operation and servicing of your equipment.

DIESEL ENGINE CATALOG, Volume 18, is an entire reference library between two covers. It is a big book, bound between hard covers and printed on heavy, durable paper for long service. Easy to read and easy to use.



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Once is not enough!

The need for blood is greater than ever, not only for men wounded in combat, but here at home . . . to cure disease, to meet accidents and disasters, and to prepare for civil defense.

Our quota can ONLY be met, if those who give *keep on* giving . . . regularly!

You CAN give more than once . . . as often as every three months with complete personal safety. The more often you give the more often you save a life. For every pint of blood you give goes to someone who needs it desperately.

Remember . . . once is NOT enough. Give blood again and again! Call your Red Cross, Armed Forces or Community Blood Donor Center for an appointment to give blood today.

GIVE BLOOD

...give it again and again

BUSINESS EXECUTIVES!
CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
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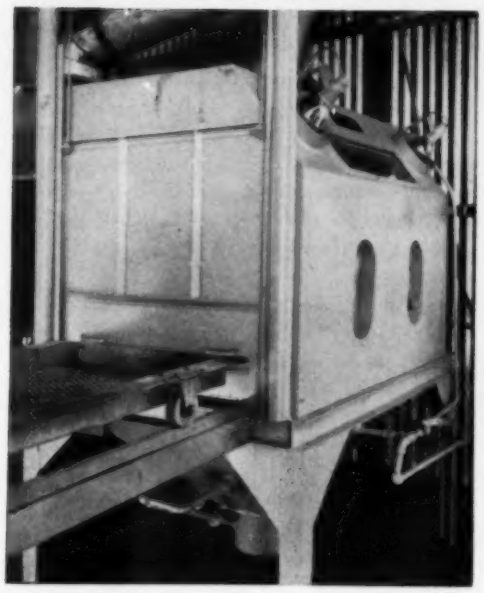
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

WET-BLAST CABINET



THE manufacture and the rebuilding of high precision parts entails the removal of burrs, rust, carbon and other surface contamination. This has usually been a hand operation involving many hours of hand polishing. Only comparatively recently has there become available devices which speed up this operation and perform the additional job of providing the slight etch required for the mechanical bonding of chrome plate. An important feature of such cleaning devices is the fact that they do not destroy critical tolerances.

The Belmont Wet-Blast Cabinet, recently placed on the market, is manufactured by the Vacu-Blast Company, Inc. This cabinet utilizes a water-suspension (slurry) of fine abrasive which, according to the manufacturer, removes carbon and rust from rods, pistons, cylinders, etc. while holding tolerances of .0001 in. It deburrs, polishes and removes surface contamination without severe etching. The Belmont blast gun claims to throw more slurry at a higher speed and cleans faster than conventional suction guns. It is claimed that stronger suction is provided by the annular air jet and slurry is pulled straight through the gun without changing direction. It is further asserted that the surrounding high speed air accelerates the slurry to a much higher speed through the efficient long converging nozzle. The light weight, trigger operated gun gives instant control with a comfortable pistol grip and is easily maneuverable.

A 700 cfm. high pressure centrifugal blower pulls vapor from the cabinet through a filter. A water spray cleans the filter and drains to a separate sump. High intensity flood lamps give a high level of illumination to the work surface. The wide view window is cleaned by a water wash with the drain trough carrying water to a separate sump. The counterbalanced door makes for easy access. The operator works from the outside through rubber gauntlet protected hand holes. Perforated work plates are easily removed. The cabinet has an overall width of 48 in., height of 6 ft. 3 in. and a depth of 36 in. Door opening is 31 in. wide by 31 in. high. Weight of the unit is 850 pounds.

Abrasives range from 50 to 2000 mesh, non-metallic, used with dispersing agent and inhibitor. The coarser sizes produce more work but give greater surface etch. The fine abrasives are slower but metal removal is less, giving less etch and holding closer tolerances. Optional dry blast attachment to use walnut shell abrasives for "soft" blasting is available at slight extra cost.

Full information regarding the Belmont Wet-Blast Cabinets made by Vacu-Blast Company can be obtained by writing Box 108, DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, Calif.

Elected Chairman

Vernon L. Durrstein

Vernon L. Durrstein, assistant chief engineer of the Engine Division of The National Supply Co., has been elected chairman of the Dayton, Ohio, chapter of the Society of Automotive Engineers. A resident of Springfield, Ohio, Mr. Durrstein is the first non-Dayton resident to be elected to that post. The chapter has 250 members, from 15 counties in West Central Ohio.

Diesel Operators Institute

The University of Nebraska is presenting a Diesel Operators Institute in Lincoln on October 15, 16, and 17. At this Institute there will be panel discussions by men from the diesel industry on the following topics: Proper Usage of Fuels and Lubricants; Maintenance of Fuel Injection Equipment; Preventive Maintenance, Importance and Procedures; Relative Economy of Oil vs. Dual Fuel Engines; Problems in Operation of Dual Fuel Engines; Operating Records and Costs; and Bearing Failures and Bearing Maintenance.

This conference is for the benefit of the men who are operating or supervising the operation of diesel power plants in the states of Nebraska, South Dakota, and Kansas. It is the second such meeting. The first which was held last year had an attendance of over seventy-five persons and was very well received.

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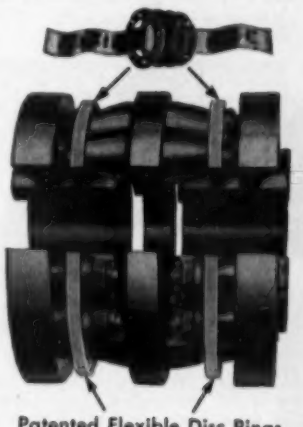
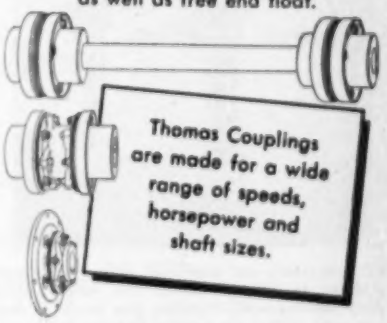
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

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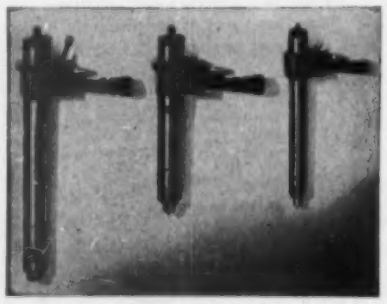
The ADECO Model "P" Single-Unit Fuel Injection Pumps are of the "port-control" type. Simple and rugged in construction and precision built by ADECO craftsmen, these pumps are extremely reliable.



ADECO injectors are available in four sizes and a number of different styles and lengths. The ADECO water-cooled injectors are made in size No. 4 only, and have built a reputation for excellent performance where heavy fuel oils are burned.

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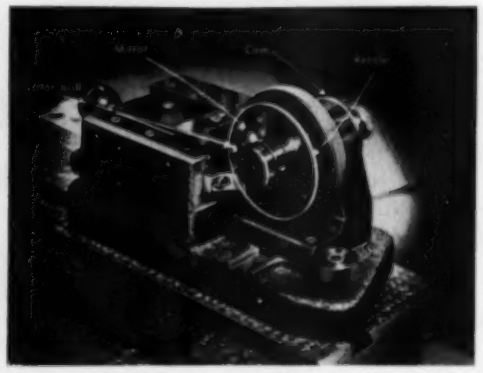
OPTICAL CAM GAGING

THE inspection of irregular cam contours is difficult for even the most seasoned inspector. To check cam contours quickly and accurately had been impossible until Optical Gaging Products, Inc., 26 Forbes Street, Rochester 11, New York, produced a method for the optical gaging of these contours. For one optical gaging customer the savings resulting from this method represented many times the cost of installing the method the very first year. Rapid, precise inspection of the entire contour is effected quickly and easily. Using the intense light of the surface illuminator of the Kodak contour projector, this optical gaging method permits inspection of cams mounted as they will be held in assembly. Basically, the method is simple. It may be likened to a "bouncing ball" method of indication. The cam is mounted on an arbor which may be turned by hand. Turning the cam actuates a follower which carries with it an indicator ball. How closely that indicator ball follows tolerance lines, also rotating with the cam, may be readily watched on the projector screen at a large magnification. The following paragraphs go into the inspection arrangement in more detail.



Side view of fixture showing side that faces projector.

The cam to be checked is mounted on an arbor of the staging fixture. The staging fixture is simple in appearance and in operation. An adjustable Y-type yoke carries two followers. One is a precision hardened steel ball which is spring-loaded to follow the contour of the cam itself. The other is a flattened circular indicator. This faithfully duplicates the motion of the follower on the cam contour. The cam to be checked is mounted on an axis common with a glass reticle. The cam is on the operator's end of the axis. The tolerance-carrying reticle is mounted on the Projector end of that axis. The motion of the reticle throughout inspection procedure is identical to the motion of the cam. The reticle is a precise actual size reproduction on glass of the contour and tolerance lines, as specified on the cam drawing. The reticle may be quickly replaced. Tolerance and contour revision may be incorporated in replacement reticles.

How does the image of the indicator ball get to the screen; First, note that the light source is the surface illuminator. A feature of the Kodak contour projector which makes this method possible is the effective location of the surface illuminator on the optical axis, within the cabinet of the projector. Biefly, the light rays issue from the projector toward the operator, but are returned by a mirror on the staging fixture to the projector's optical system, carrying with them the images seen on the screen. In more detail: Incorporated in the staging fixture, on the operator's side of the reticle, is a mirror facing the contour projector. The light from the surface illuminator passes through the glass reticle to this mirror. The light is then reflected back through the glass, past the black tolerance lines of the reticle, into the projector's optical system and so on to the viewing screen. The images of the tolerance lines and indicator ball are thus projected onto the screen at any selected magnification. Initially, the cam and the reticle are brought into complete coordination as far as angular and radial location of a starting check point is concerned. This is accomplished by making adjustments so that the image of the indicator ball is tangent with the image of a "set-line" when the set-master provides a V-notch for positive location of a cam follower ball at an initial reference point specified on the part drawing. Adjustments are provided to lock the setup securely in position. The set-master is then replaced with an actual cam, and the checking procedure may proceed for all points around the periphery of the cam. The spring-loaded follower ball traces the contour of the cam, and the indicator ball on the reticle side will accurately follow its position in relation to the master reticle being projected on the screen.

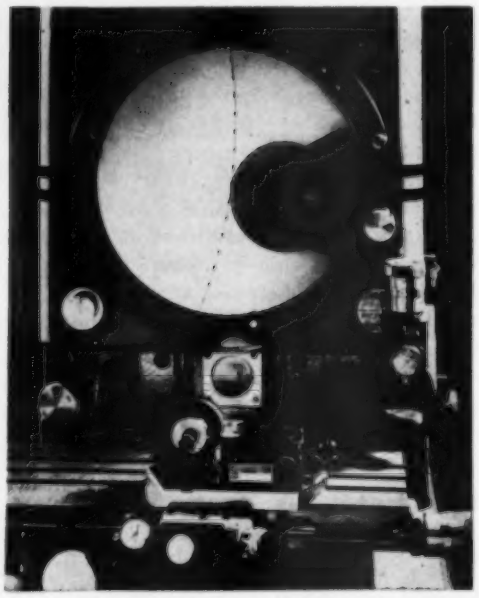
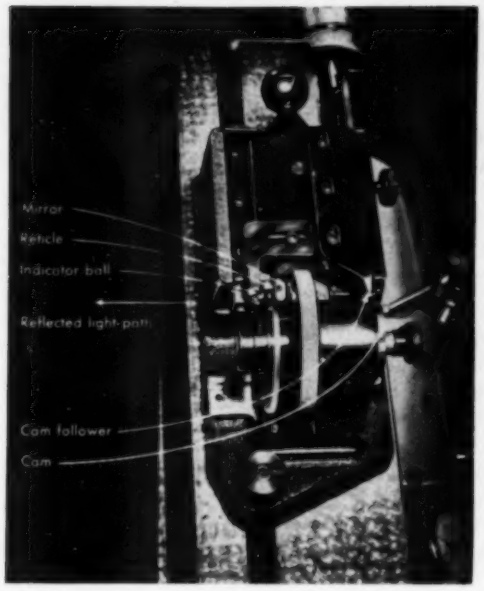


Image of indicator ball within projected tolerance lines immediately proves this dimension of cam satisfactory.

Often the tolerances of cam contours are called out at only specified angular intervals; in this case, at one-half degree intervals. In addition, the total tolerance for any one check point may vary from the total tolerance of another check point. These variations in tolerance along the contour of the cam are accurately reproduced on the reticle glass. The cam contour is drawn through all the variable tolerances at all locations. So, actually, every point along the contour gets an immediate visual check. Thus, not 720 points, at a one-half degree interval along the contour, but an infinite number of points are checked in this manner. Any pits, blemishes, tool marks, and scratches of any nature, which may throw intermediate points out of tolerance are indicated positively on the viewing screen.



Top view of fixture with cam and reticle in position for inspection.

Previous inspection of these cams, with tolerances as close as .0005 in., required 13 hours per cam for inspection by an experienced inspector. The optical gaging method has reduced this to inspection of the entire contour within 40 seconds with an inexperienced operator. With this optical gaging method there is no wear problem, nor are there any difficult adjustments to make. Vulnerability to handling is eliminated, simplicity assures reliability. This rapid setup for a large variety of shapes and sizes of cams should be invaluable for any plant concerned with cam production.

Diesel Convention in Kansas City

The Annual Diesel Convention which was held this past year in Milwaukee will be held at the Muehlebach Hotel in Kansas City June 14 to 17. The official title is the Oil and Gas Power Division of the ASME and those of our friends among the accessory manufacturers who are planning to exhibit at this Annual Diesel Meeting should reserve their space without delay. Contact Mr. Joseph Clark, ASME, 29 West 39 Street, New York, N.Y. Mr. Clark is in charge of the sale of space in the exhibit section at the Muehlebach Hotel.

It is anticipated that the attendance at the 1954 meeting will exceed 400 engineers, many, of course, direct from the engine manufacturers themselves but a large number from the big diesel operating plants in the area adjacent to Kansas City. These latter include municipal plants, public utility diesel plants and pipeline pumping stations.

Details of the program will be carried in this magazine in a coming issue. In the meantime, our friends in the accessory end of the business are urged to make their reservations with Mr. Clark.

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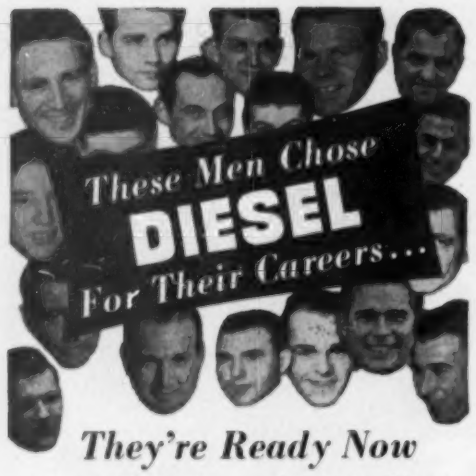

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West Coast Diesel News

By **Fred M. Burt**

REPLACING a 26-hp. @ 1500-rpm. Caterpillar diesel which has been in service for 13 years, Sal Ortisi of San Francisco has repowered his combination boat *Jesie Ortisi* with a 38-hp. @ 1600-rpm. Cat diesel to obtain more speed and power. Both engines were purchased from Thomas A. Short Co., San Francisco.

SUPPLIED by San Diego GM dealer General Truck & Engine Co. for Floyd Hill's 38 ft. *Devi-Dee* a two cyl. 55-hp. GM diesel.

TWO NEW Model TS-200 Allis Chalmers scrapers powered with 165-hp. Cummins diesel engines purchased from Shaw Sales & Service Co., Los Angeles by Jack Riley & Son, Santa Ana contractors, are currently in use on large scale highway earthmoving.

A DIESEL-GENERATOR set to supply electricity for motion picture production for Cinemagraphia in San Carlos, Brazil was built by Euclid Machinery & Equip. Co., Los Angeles, using an 8-cyl. 500-hp. General Motors Cleveland diesel, driving a 300-kw., 125 volt Westinghouse generator.

BUILT AT the Al Larson Boat Shop, Terminal Island, for the Gugliemo family, the new 57 ft. purse seiner *St. Aniello II* with a capacity of 60 tons of sardines is powered with a 230-hp. General Motors diesel engine.

FOR RE-POWERING a Plymouth locomotive at the Trona (Calif.) plant of American Potash and Chemical Co., a 165-hp. Cummins diesel from Cummins Service & Sales, Los Angeles.

THE TUG *H. T. Haviside* powered with a Union diesel engine has recently been working off the stormy, rockbound Pacific Coast near Ano Nuevo Island on annual submarine pipeline maintenance work; having also within the past six months installed a new pipeline near the Mexican border plus having overhauled nearly a dozen moorings between there and the Oregon border.

THE City of Brawley (Calif.) has recently replaced a gasoline engine in an Austin-Western roller, with a 60-hp. Buda diesel engine.

A NEW 150-hp. Cummins diesel engine has been installed in the No. 1 Scale car at Bethlehem Pacific Coast Steel Corp. plant in Los Angeles. Scale cars are used in carrying scrap on to scales for weighing before charging electric furnaces.

A. S. LEONARD, previously Southwest Regional Manager for Cummins Engine Co., office Los Angeles, with J. D. Dennedy from Cummins factory, now has the Cummins dealership for New Mexico, part of Texas; Leonard has headquarters in El Paso, Dennedy in Albuquerque.

FROM Bellingham (Wash.) Engine & Equip. Co. for Phil Cope, Anacortes, one of the new General Motors new 4-51 diesel engines for installation in his 53 ft. troller *Elmarue*.

FROM Engine Div., National Supply Co., Terminal Island, a new 18-hp., at 1800-rpm. Lister diesel sold to Fred Wolleson for lineshaft drive on his boat *Argo*.

FOR HANDLING aggregate at the Arrow Rock Co. Sun Valley (Calif.) plant, three single engine Euclid scrapers powered with 200-hp. Cummins diesels.

PURCHASED BY Columbia Iron Mines, Cedar City, Utah, three huge Dart dump trucks powered with 350-hp. Waukesha diesel engines.

TO MODERNIZE drilling rigs in the Ventura field, Rocky Mountain Drilling Co., of Beverly Hills, has purchased 12 465-hp. Waukesha natural gas engines from Oil Well Supply Co., Los Angeles.

IN CONVERTING 34-ft. cabin cruiser *My Alibi* to an albacore boat, Bill Erickson and partner Sam Miller (San Pedro) a new 3-cyl., 66-hp. P & H diesel engine was installed for propulsion; a 5-hp. Crofton diesel for refrigeration.

PURCHASED BY California Electro Farm Service, Mendota, Calif., a Caterpillar 75-kw diesel-electric set (150-hp. diesel engine) to supply current for their weed eradication operations.

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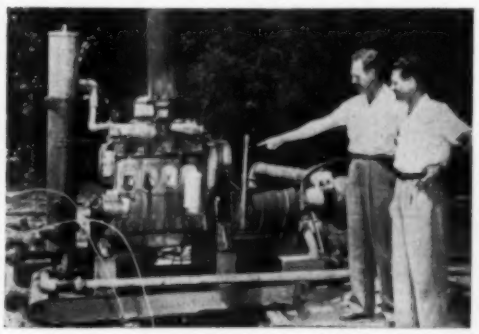
New Edition of Refrigeration Manual

A completely revised edition of the Trane Refrigeration Manual has been published by The Trane Company, La Crosse, Wisconsin, manufacturer of heating, air conditioning and ventilation equipment. The manual gives practical, easy-to-understand information on installation, operation and servicing of refrigeration equipment for contractors and servicemen. The latest edition of the Trane Refrigeration Manual contains two entirely new chapters on refrigeration piping. This material embodies the latest engineering data on the subject. Other changes include a new chapter on refrigeration system control, a revised chapter on service operation and a completely revised refrigeration system service analysis chart.

The manual begins with a discussion of refrigerants and the refrigeration cycle. Succeeding chapters give detailed information concerning the selection, installation and servicing of all the component parts of refrigeration systems, including evaporators, compressors, condensers, thermostatic expansion valves, refrigeration system control equipment, motors and motor control equipment, heat exchangers, dryers, valves, piping and accessories. The text is illustrated with photographs, drawings, charts and graphs. Now in its ninth printing since it was first published in 1946, the manual has also been use dextensively as an educational text and source reference on refrigeration by colleges and industrials. The revised, 125 page manual can be purchased from The Trane Company, La Crosse, Wisconsin, for $1.50.

Irrigation Diesel



This comparatively small diesel engine hooked to an irrigation pump stands by for action whenever a damaging drought threatens the crop of a soy bean and flower farm near Memphis, Tennessee. Pumping through a six-inch main to sprinklers the unit can put up to 2000 gallons per minute over an area of 210 acres. The installation was engineered and completed in one day for Walker Nurseries by Lewis Diesel Engine Company, GM Diesel Distributors of Memphis. Observing the unit in action are Warren K. Walker, owner of the Nursery and S. P. Vinson of the Lewis Diesel Company.

Adds Oregon Distributorship

The Megorden Machinery Company of Clearwater, Washington which has had the Washington State distributorship for Witte engines has also been awarded the distributorship for the state of Oregon. The company plans on setting up dealers in Oregon to sell these engines and diesel-electric plants.

Chrome "Unitized" Oil Control Piston Ring

Reduction in engines rejected by inspectors at your plant Scuffing virtually eliminated at run-off and for the life of the engine. A higher level of oil economy for longer periods. Reduced ring wear, reduced bore wear and reduced friction. These are the claims made for the new multiple-piece chrome plated oil control ring which has been introduced by the Muskegon Piston Ring Co., supplier to the automotive industry. This exclusive and patented ring has been named the "Unitized" CSR-200. It is pre-assembled at the factory, and bonded together with a special adhesive agent that dissolves in the heated engine oil during run-in, thus the ring is easier and more convenient to install, both on the production assembly line and in the service shop.

Automotive engineers in both the truck and passenger car field have long recognized the advantages of chromium plated oil rings to extend the oil control life in their new high compression engines, but the cost of chrome plating the conventional type cast iron oil ring has seriously restricted the practice. Now, however, this much desired oil control extension is available through the CSR-200 ring, according to the manufacturer. Furthermore, its "Unitized" feature makes it admirably suited for original equipment use. The CSR-200 ring is all-steel, unbreakable, and will not plug with carbon.

Orders 30 Diesel-Electrics

Rapidly expanding its dieselization program, the Northern Pacific Railway has ordered 30 additional diesel-electric locomotives at an approximate cost of $4,500,000. It is expected that the new units will be in service by next year. These additional locomotives will give the Northern Pacific a total of 297 diesel units in service. At present, about 80% of the passenger service is dieselized with all main-line passenger trains powered by diesel. Freight service is 54% diesel and yard work is 56% diesel.

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From Diesel Engines

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- Eliminate Seat Distortion and Blow-by or Hot Spots Which Cause Valve Port Cracks!
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Heat expands seat with downward pressure, locking tighter. Note expansion clearance between threads.

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For more information contact the P-B Master shop in your city or write direct to:

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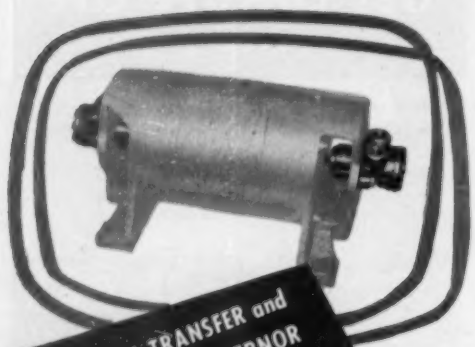

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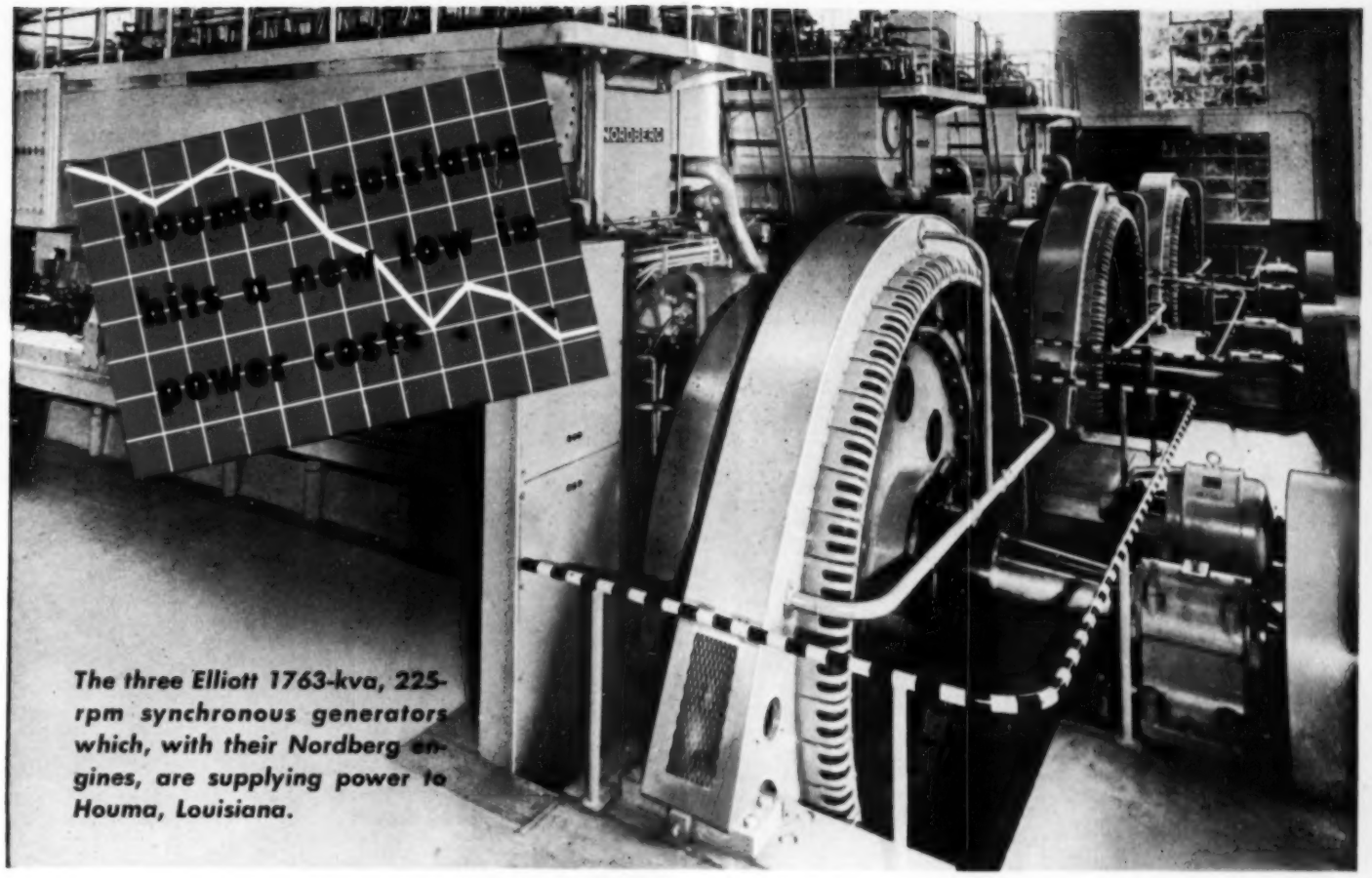
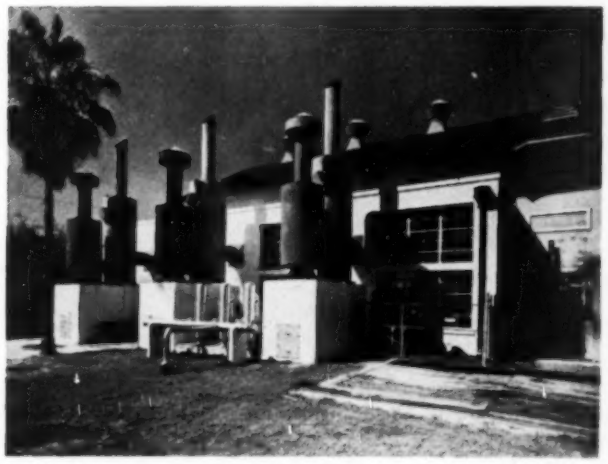


The three Elliott 1763-kva, 225-rpm synchronous generators which, with their Nordberg engines, are supplying power to Houma, Louisiana.

Three Elliott Generators

on the business ends of Nordberg duafuel five-cylinder diesels, are spinning out kilowatts for the enterprising Louisiana city of Houma, and at a gratifyingly low overall cost.



View of the Houma Municipal Plant, showing the exhaust and intake silencers for the three new diesel engines.

The installation represents a modernization program undertaken in 1949, which almost triples plant capacity over former output. The previous equipment now provides standby service only. The three new engines operate on natural gas, each developing 2000 hp at 225 rpm. The Elliott generators are each rated 1765 kva, 80 per cent power factor, 3 phase, 60 cycle, 2400/4160 volts.

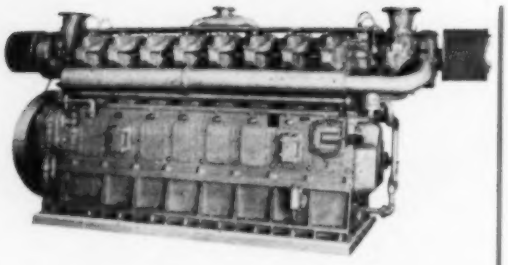
Congratulations are due the engineers of Houma for the skilled administration which combines with superior equipment for exceptional economy in city power costs.

For details about Elliott generators and motors, contact your local Elliott representative or write Elliott Company, Ridgway, Pa.

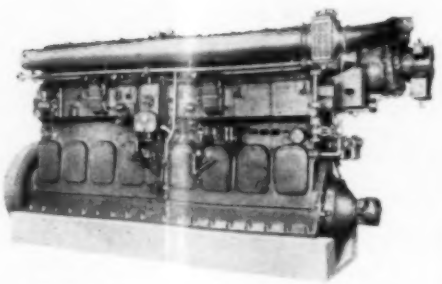
ELLIOTT Company

RIDGWAY DIVISION

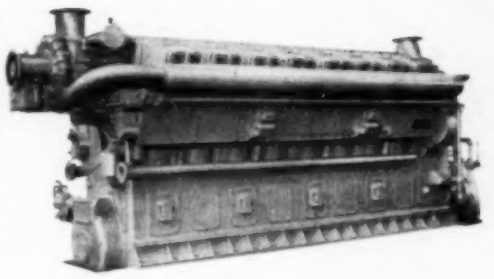
R2-10



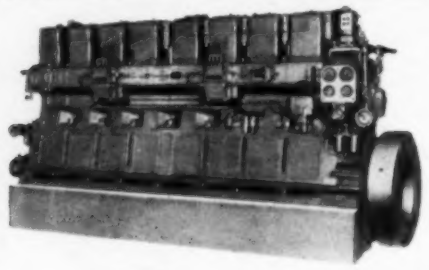
TYPE FVA ..... 8, 12 or 16 cyl.
Diesel — Atmospheric ..... 430 to 1150 hp.
Diesel — Supercharged ..... 1110 to 2230 hp.



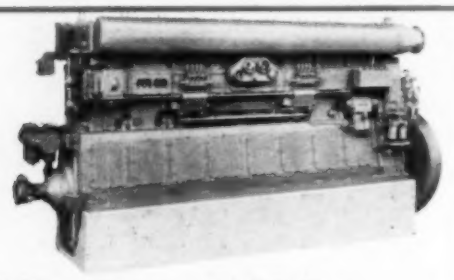
TYPE LS ..... 6, 7 or 8 cyl.
Atmospheric and Supercharged
Gas ..... 720 to 2500 hp.
Diesel ..... 825 to 2500 hp.
Gas-Diesel ..... 825 to 2500 hp.



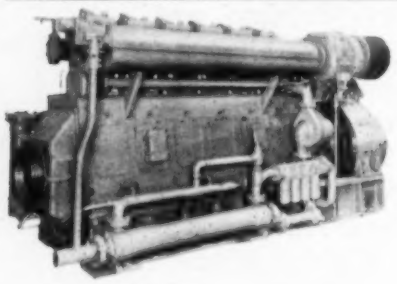
TYPE LSV ..... 12 or 16 cyl.
Atmospheric and Supercharged
Gas ..... 1440 to 5000 hp.
Diesel ..... 1650 to 5000 hp.
Gas-Diesel ..... 1650 to 5000 hp.



TYPE JS ..... 5, 6, 7 or 8 cyl.
Atmospheric and Supercharged
Gas ..... 375 to 1815 hp.
Diesel ..... 430 to 1815 hp.
Gas-Diesel ..... 430 to 1815 hp.



TYPE GS ..... 5, 6 or 8 cyl.
Atmospheric and Supercharged
Gas ..... 320 to 1460 hp.
Diesel ..... 300 to 1460 hp.
Gas-Diesel ..... 300 to 1460 hp.



TYPE FW ..... 6 cyl.
Diesel — Atmospheric ..... 245 to 500 hp.
Diesel — Supercharged ..... 350 to 835 hp.

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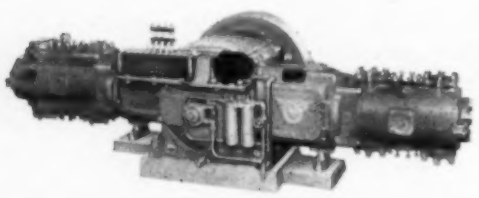
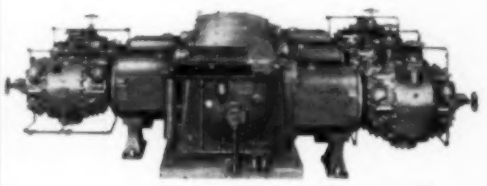


TYPE EM
To 350 hp.
9" stroke
Speed to 514 RPM

TYPE FM
To 1500 hp.
10½" stroke
Speed to 514 RPM



TYPE JM
500 to 3000 hp.
14" stroke
Speed to 327 RPM